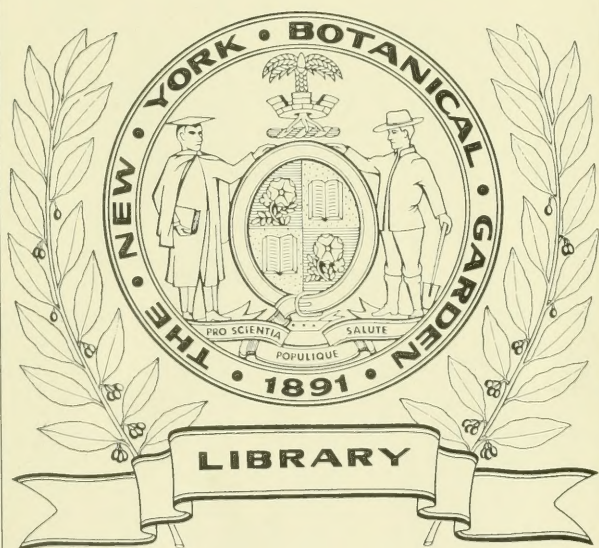


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T

ON PARAPHALAEENOPSIS

Alex D. Hawkes

In 1963, I established the genus Paraphalaenopsis (in Orquidea 25: 212), to accommodate three attractive epiphytic orchids previously contained in Phalaenopsis Bl. These terete-leaved plants have been utilized to a considerable extent in critical multigeneric hybridization. The serious orchid breeders who have in the past worked with these Paraphalaenopsis by and large agree with my decision to segregate the trio of species from Phalaenopsis Bl. Several of my learned orchidological colleagues have as well recognized the new genus.

In a recent paper, however, Dr. R. E. Holttum (in Orch. Rev. 74: 290), has described a new natural hybrid orchid, purportedly of wild origin and imported from Indonesia, as a Phalaenopsis. This is puzzling, since in previous publications, he has indicated his dissatisfaction with the retention of these terete-leaved species, with all of their floral aberrancies, in that genus.

I do not consider this orchid to be correctly placed in Phalaenopsis of Blume, as it is currently delimited, and propose, therefore, the following new status for it:

PARAPHALAEENOPSIS x THORNTONII (Holttum) A.D. Hawkes,
comb. nov.

(Phalaenopsis x Thorntonii Holttum in Orch. Rev. 74: 291.
1966.)

The type specimen reposes in the Herbarium of the Royal Botanic Gardens, at Kew. It was obtained from a commercial orchidist in Florida, who has assured Holttum that the plant was imported from Indonesian Borneo (= Kalimantan).

Holttum indicates that this is a natural hybrid between what most of us term Paraphalaenopsis Denevei (J. J. Sm.) A. D. Hawkes and P. serpentilingua (J. J. Sm.) A. D. Hawkes, and, further, comments that "I note that Mrs. Gracia Lewis has given the grex name Sunny to the offspring of the artificial hybrid P. denevei X P. serpentilingua. This does not invalidate the present name x thorntonii, which is based on a particular type specimen, and, as noted above, is probably not a first cross between the two postulated parent species."

STUDIES IN THE EQUITANT ONCIDIUMS

W. W. G. Moir and Alex D. Hawkes *

Introductory Notes

Oncidium Sw. section Equitantia Ldl. (Orchidaceae), the very popular Equitant Oncidiums of horticulture, consists of some twenty-two species, with innumerable forms from various locations amongst their insular distribution. There are about a dozen distinct varieties of these species, and several obvious natural hybrids.

Because of this extensive natural hybridization, it becomes essential to know what hybrids manufactured by man look like to be positive of the determinations of the plants found in nature. The senior author has collected these Oncidium species, their formas, their varieties, and their natural hybrids over a period of twenty years in the Greater Antilles; he has as yet not had the opportunity to search for them in the Lesser Antilles, where several interesting entities occur.

This group of Oncidiums exists naturally only in the West Indies, including the Bahamas, and in South Florida. All past records of collections made in South America and Central America are to be considered most doubtful, since no preserved herbarium specimens authenticate these, insofar as we are aware.

The species are in general endemic to each island, or group of islands, such as the Bahamas, the Virgins, or the islets around Antigua. Oncidium variegatum (Sw.) Sw., however, the type species of the section, does exist on several of the Antillean islands, and thus gives rise to development of a number of forms. These are quite easily recognized when in flower; all possess a crest on the labellum which is the same.

A group of species with highly colored leaves, in which anthocyanin is strongly developed, occurs in Jamaica, and a similar instance is to be found in Antigua. Another factor common to these is their compact growth habit. The Jamaican species of this group

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are Oncidium pulchellum Hk., O. tetrapetalum (Jacq.) Willd., O. berenyce Rehb. f., O. triquetrum (Sw.) R. Br., and O. gauntlettii Withner & Jesup. There are also many natural hybrids amongst the first three named, and their progeny has again hybridized to form great natural hybrid swarms in certain isolated spots on the island.

The group similar to O. variegatum (Sw.) Sw. in flower color and general vegetative appearance all have long rhizomes between the fan-shaped growths. These are O. bahamense Nash, O. sylvestre Ldl., and O. velutinum Ldl. All are much stronger in growth than O. variegatum (Sw.) Sw., and are tetraploids, but not of O. variegatum, since the type of growth and details of the crest on the labellum are distinctly different. Then, too, in the case of O. bahamense Nash, the leaves possess a high development of anthocyanin and are erect and semi-terete. Similar in basic vegetative appearance to O. variegatum (Sw.) Sw., but with very tiny growths and flowers of totally different character is the new O. hawkesianum Moir, from Cuba.

Nearly all the other species of this Equitant Oncidium alliance belong in an assemblage of plants producing compact, small growths, comprised of heavy leaves. There are no appreciable rhizomes between vegetative growths, when present these being extremely abbreviated. O. intermedium Bertero is the type species for this group, and its square, "bulldog-nose"-like type of labellum crest is found in various forms in this alliance. The greatest and horticulturally most attractive variations in O. intermedium Bertero occur in Haiti. Forms which flower at different times of the year are to be found in the Dominican Republic and in Haiti, and there are, as well, two or three distinct varieties.

Oncidium lucayanum Nash, from the northern Bahamas, O. prionochilum Krzl. from the Virgin Islands, and O. haitiense Leonard & Ames and O. quadrilobum C. Schweinf. from both Haiti and the Dominican Republic, are all incorporated in this group, but none could in any way be considered referable to forms of O. intermedium Bertero.

In Hispaniola there are others of these Oncidiums whose habit is compact as in the O. intermedium group, but their vegetative manner is different, and the all-important details of the crests of the labella are widely divergent. O. henekenii Schomb. ex Ldl. has a large flat disk-like crest; O. tuerckheimii Cgn. grows upside down and occurs at high elevations for the Equitant Oncidiums, where it even withstands occasional frost; O. compressicaule

Withner is found at medium elevations, and in many ways does not appear to belong in this group; and O. arizajulianum Withner and Jiménez, a most recently-described plant.

Most of these Equitant Oncidiums grow in areas of limited rainfall. Several of them (O. henekenii, O. quadrilobum, O. haitiense, and a forma of O. variegatum) occur under arid conditions among thorn bushes, cacti, often with xerophytic bromeliads (Tillandsia spp.). At the other extreme, we find O. sylvestre, which occurs in the pine forests at high elevations (6000 ft.), where they live in the grass and fallen pine needles. These orchids are very hardy, and have changed to different "host" plants when the light forest and shrubbery is cleared off. In Haiti, O. variegatum grows on lantana on the roadside, as well as in citrus trees; O. velutinum prefers calabash trees (Crescentia Cujete L.); and O. intermedium now prefers both coffee trees and lantana at elevations of around 2000 feet.

Each species in this Equitant Oncidium aggregation possesses a very characteristic crest on the labellum of the flower, each one distinctly different from its related taxa. The details of this crest remain the same, no matter how the size, shape, and color of the flowers may vary due to location on the various islands.

Articles pertinent to the present study have been published by the senior author in the following periodicals:

American Orchid Society Bulletin 28: 896. 1959 (with two illustrations inverted through editorial error).

Pacific Orchid Society Bulletin 17: 64 - 80. 1959, with colored plate.

Florida Orchidist 5: 142 - 152. 1962, but unfortunately the illustrations here are improperly captioned by the editors.

American Orchid Society Bulletin 35: 45. 1966.

Checklist of the Equitant Oncidiums

The following is a listing of the taxa of Oncidium Sw. section Equitantia Ldl. which at the present time are considered valid by the authors. This should, however, be considered a preliminary roster, since subsequent exploration of the habitat region and critical research will doubtless add in considerable degree to it.

For the convenience of the reader, the taxa are indicated in alphabetical sequence.

- O. arizajulianum Withner & Jiménez in Amer. Orch. Soc. Bull. 36: 220, with pl. page 218 (there confusingly captioned "Oncidium arizae Withner & Jiménez"). 1967.
- O. bahamense Nash ex Britt. & Millsp., Baham. Fl. 97. 1920.
- O. berenycæ Rchb.f. in Bot. Zeit. 20: 215. 1862, as berenice.
- O. compressicaule Withner in Amer. Orch. Soc. Bull. 35: 719. 1966, as compressicaulis.
- O. x floride-phillipsae Moir & Hawkes, infra. (O. prionochilum Krzl. X O. variegatum (Sw.) Sw. var. purpureum Moir & Hawkes)
- O. gauntlettii Withner & Jesup in Amer. Orch. Soc. Bull. 33: 461. 1964.
- O. gundlachii C. Wright ex Griseb., Cat. Pl. Cub. 266. 1866.
- O. haitiense Leonard & Ames ex Ames, Orchid. 7: 159. 1922.
- O. hawkesianum Moir, infra.
- O. henekenii Schomb. ex Ldl., Fol. Orch. Oncid. 11. 1855.
- O. intermedium Bertero ex Spreng., Syst. Veg. 3: 728. 1826.
- var. alborubrum Moir & Hawkes, infra.
- var. album Moir & Hawkes, infra.
- O. x jamaicense Moir & Hawkes, infra. (O. pulchellum Hk. X O. tetrapetalum (Jacq.) Willd.)
- O. leiboldii Rchb.f. in Walp., Ann. 6: 718. 1863.
- var. album Moir & Hawkes, infra.
- var. majus Moir & Hawkes, infra.
- O. lemonianum Ldl. in Bot. Reg. 21: pl. 1789. 1835.
- O. lucayanum Nash ex Britt. & Millsp., Baham. Fl. 98. 1920.
- O. osmentii Withner in Amer. Orch. Soc. Bull. 36: 220, pl. 1967.
- O. prionochilum Krzl. in Engl., Pflanzenr. IV, 50: 233. 1922.
- O. pulchellum Hk. in Bot. Mag. pl. 2773. 1827.
- O. quadrilobum C. Schweinf. in Amer. Orch. Soc. Bull. 14: 476. 1946.
- O. x sanctae-anae Moir & Hawkes, infra. (O. berenycæ Rchb.f. X O. pulchellum Hk.)
- O. sylvestre Ldl. in Ann. & Mag. Nat. Hist. III, 1: 332. 1858.
- O. tetrapetalum (Jacq.) Willd., Spec. Pl. 4: 112. 1806.
- O. triquetrum (Sw.) R.Br. in Ait., Hort. Kew., ed. 2, 5: 216. 1813.
- O. tuerckheimii Cgn. in Urb., Symb. Antill. 7: 181. 1912.
- O. urophyllum Lodd. ex Ldl. in Bot. Reg. 28: pl. 54. 1842.
- O. usneoides Ldl. in Ann. & Mag. Nat. Hist. III, 1: 333. 1858.
- O. variegatum (Sw.) Sw. in Vet. Akad. Handl. Stockh. 21: 240. 1800.
- var. album Moir & Hawkes, infra.
- var. purpureum Moir & Hawkes, infra.
- var. roseum Moir & Hawkes, infra.
- O. velutinum Ldl. in Paxt., Flow. Gard. 1: 166. 1851.

O. x withnerianum Moir, infra. (O. berenyce Rchb.f. X O. tetrapetalum (Jacq.) Willd.)

ONCIDIUM x FLORIDE - PHILLIPSAE Moir & Hawkes, nat. hybr.
nov. (O. prionochilum Krzl. X O. variegatum (Sw.) Sw.
var. purpureum Moir & Hawkes)

Habitu inter parentiis intermedium, differt in amplitudinis colorisque floribus.

Pseudobulbs absent. Leaves to 8 in number, rigid, broadly lanceolate, acuminate, cartilaginous, serrate marginally, mostly falcate three-sided, the upper edges canaliculate with groove deepest at center, 6 - 8 cm long, 8 - 15 mm broad at middle. Scape initially erect, later arching under weight of first flowers, and still later producing adventitious plantlets at joints of peduncle below flowers, up to 80 cm long; bracts small, triangular. Flowers of most unusual coloration—purple on reverse, and yellow with purple edges on frontal surface, this side similar to the color of O. prionochilum Krzl., with the marginal markings of the other parent. Dorsal sepal oblong, 8 - 10 mm long, 2 - 3 mm broad, mostly yellow frontally, and purple behind. Lateral sepals connate into a synsepal, slightly longer than dorsal. Petals obovate to cuneate, acute 8 - 10 mm long, 4 - 6 mm broad at a point three-quarters from apex, yellow with distinct purple margin. Lip with small oblong, slightly reflexed lateral lobes, rounded at apex, 4 - 5 mm long; separating these from the lower lobes is an isthmus of 5 - 6 mm length and 1.2 cm width, this bearing a crest which is a combination of both parents, in 3 series; the two lower lobes large, quadrate, each 2 cm in diameter, the length from base to apex of lip 2.7 cm, the breadth similar, the color a yellow pattern of O. prionochilum Krzl. superimposed on the purple of the other parent, so that the sharply dentate edge of its lip shows clearly on the margin of purple surrounding it. Column-wings large, acute at apex, extending above the anther-cap.

VIRGIN ISLANDS: St. Thomas: Water Isle, in harbor of Charlotte Amalie, in shrubs and on mossy humus on the ground, alt. about 25 feet, summer 1963, Walter Phillips s.n., flowering in cultivation, Honolulu, 1966 (Type in Herbarium of Bishop Museum).

This striking natural hybrid, the most unusual one in this section of Oncidium known to date by the authors, is completely intermediate between the two parents, except for dimensions

and coloration of the flowers. The influence of *O. variegatum* (Sw.) Sw. var. *purpureum* Moir & Hawkes is at once apparent, with the yellow hue of *O. prionochilum* Krzl. evident only on the anterior face of the flower.

Oncidium x *floride-phillipsae* is named to honor Floride Phillips, the wife of the original collector of this unique orchid on his own property at Water Isle.

ONCIDIUM HAWKESIANUM Moir, sp. nov.

Planta parvissima, caespitosis effucis producta. Floribus inter sectione generis distinctis.

Plant very small for the genus, 2 - 3 cm tall. Pseudobulbs absent. Rhizomes 10 - 20 cm in length, wirey, 1 mm in diameter, arising from leaf-axils and forming a mass of growths extending in all directions. Leaves short and fat, to 2 - 2.5 cm long and 8 mm broad, cultrate, compressed, canaliculate, oblong, obtusely acute, towards apex of individual leaf-fans more heavily denticulate than below on each. Inflorescences slender, erect, 8 cm long, racemose, with 2 - 4 flowers; floral bracts very small. Flowers with sepals and petals greenish with pink flush, the lip bright pink, with the crest dark yellow. Dorsal sepal lanceolate, clawed at base, apiculate, 5 - 6 mm long and 1 mm broad. Lateral sepals connate to form a synsepal hidden behind the lip. Petals oblong, rounded-apiculate, 6 - 7 mm long and 2 mm broad. Lip convex, with lower lobes reflexed at sides to give the appearance of a half-tube or of a full skirt; lower lobes 1 cm in diameter from crest, with apex slightly sinuate; upper lobes minute, rounded, the isthmus between both sets of lobes short and narrow; crest rich yellow, with tubercles in 2 series, the center projection of lower series the most prominent. Column-wings small, scimitar-shaped, acute, denticulate to entire.

CUBA: Oriente: Northern coast, but precise locality not known. Flowering in cultivation, Honolulu, 1953, *Moir s. n.* (Type in Herbarium of Bishop Museum).

This unique species, among the most diminutive of all members of the genus *Oncidium* Sw., does not appear to be allied to any species heretofore described. Its growth is somewhat reminiscent of a very miniature form of *O. variegatum* (Sw.) Sw., from which it is at once distinguished by its rampant clump-forming habit and by both structure and coloration of the attractive flowers.

Oncidium hawkesianum is named, with pleasure, to honor my very good friend, the junior author of this study, whose works are well known to orchidists and orchidologists in all parts of the world.

ONCIDIUM INTERMEDIUM Bertero ex Sprengel, Syst. Veg. 3: 728. 1826.

The typical species occurs extensively in Hispaniola, both in Haiti and the Dominican Republic, growing as an epiphyte on small trees in dry shrubby areas, seldom at altitudes exceeding 2000 feet.

Marked variations occur among flowering periods of O. intermedium and its variants in the wild. The smaller forms bloom during the spring months in Eastern Hispaniola, e.g., at El Seibo, D.R. The medium-sized forms produce their flowers during the summertime in the central part of the island, e.g., San José de las Matas and Cabral. And the largest forms flower during the autumn months in Haiti, e.g., southwest of Grenier. These characteristics are maintained even when the plants are removed to far-distant places, and all are grown under one climatic condition, as in the senior author's collection at "Lipolani" in Honolulu. Through artificial hybridization, the forms from Central Hispaniola and the western part of the island, Haiti, combined, produce still further increases in floral but not vegetative dimensions.

We presently consider the following two variants of Oncidium intermedium worthy of botanical establishment:

ONCIDIUM INTERMEDIUM Bertero ex Spreng. var. ALBORUBRUM Moir & Hawkes, var. nov.

Differt a forma typica planta dimidia compacta, floribus dimidia, sepalis petalisque albis, labello aurantiaco.

Similar in growth habit and shape to the typical species, but plant half-size, about 5 cm tall, more compact, with inflorescences 10 - 20 cm tall, with flowers half the size, and averaging about 10 per inflorescence. Sepals and petals are white, while the lip is orangey-red.

HISPANIOLA: Haiti and the Dominican Republic (the variety occurs in both countries), near Dajabón in D.R. and southwest of Grenier in Haiti, epiphyte, alt. 100 - 1800 feet, 1958, flowering in cultivation, Honolulu, 1963. (Type in Herbarium of Bishop Museum).

Natural hybrids occur, in Haiti, Département de la Ouest, between the typical species and this handsome var. alborubrum, in which white, red, yellow, and patterned parts are found mixed amongst sepals, petals, and labella.

ONCIDIUM INTERMEDIUM Bertero ex Spreng. var. ALBUM
Moir & Hawkes, var. nov.

Differt a forma typica planta dimidia, floribus dimidia albis, in crista labello flava ornata.

Similar in growth habit to the typical species, but half the size, about 5 cm tall, with flowers half the size, fewer in number, borne on inflorescences 10 - 20 cm tall. Sepals, petals, and lip are all pure white, with only a touch of yellow on the crest of the lip.

HISPANIOLA: Haiti: in area southwest of Grenier, growing as epiphyte on lantana, collected by William Osment of Hollywood, Florida, 1966.

ONCIDIUM x JAMAICENSE Moir & Hawkes, nat. hybr. nov.
(O. pulchellum Hk. X O. tetrapetalum (Jacq.) Willd.)

Habitu inter parentiis intermedium, floribus intermediis, variabilis.

Pseudobulbs absent. Growth compact, as in both parents, closer to that of O. tetrapetalum (Jacq.) Willd., the leaves 6 - 10 in number, lanceolate, acute, canaliculate, rigid, to 15 cm long and 3 mm broad, the margins slightly denticulate. Inflorescence erect, the scape to 40 cm tall, racemose; floral bracts narrowly triangular, membranaceous, 3 mm long; pedicel with ovary variable in length from 1.5 - 3.5 cm long. Flowers showy, all segments variable in color from white to pink with markings of dull reddish-brown on sepals, petals, and isthmus of the lip. Dorsal sepal oblong, narrowing considerably toward base, acute. Lateral sepals connate into a concave, oblong, obtuse synsepal with a 2-apiculate tip, this segment hidden by the lip; all sepals 8 mm long, or the synsepal often somewhat longer. Petals obovate, obtuse to shortly apiculate, marginally crenulate, 1 cm long and 6 mm broad. Lip 4-lobed, the anterior pair of lobes squarish, retrorse, the extension of the isthmus upwards broader at top than bottom; lobes of midlobe varying from slightly reflexed to slightly concave, broad, reniform, deeply emarginate apically, undulate; lip white to pink (never rose, as in O. pulchellum Hk.), 1.5 cm long and 1 - 2 cm broad at widest point; crest yellow, composed of 5 tubercles, of which the median one in the lower set is most prominent. Column-wings large, scimitar-shaped, acute, denticulate.

JAMAICA: Mostly near Brownstown, epiphytic in dry forest on short trees, alt. 1500 feet, 1955, flowering in cultivation, Honolulu, 1967, Moir s.n. (Type in Herbarium of Bishop Museum).

This striking natural hybrid is not widespread in Jamaica, being known to date principally in St. Ann Parish. Its flowers vary in coloration, depending apparently on whether the O. pulchellum parent had blossoms of light rose or dark rose hue.

Oncidium jamaica is designated as a natural hybrid, with the same parentage, on page 571 of Sander's One-Table List of Orchid Hybrids 1946 - 1960, Volume 1 (May 1961), and on pages 573 and 574 of the same work, it is listed as Oncidium Jamaica, with an initial capital letter. Moir states: "I had named my hybrid Oncidium jamaica (O. pulchellum Hk. X O. tetrapetalum (Jacq.) Willd.) and was about to register it as that when I showed this to David Sander at the 2nd World Orchid Conference. So he decided to put the fact in the Sander's One-Table List."

ONCIDIUM LEIBOLDII Rchb.f.

The typical species occurs in Cuba and Puerto Rico, but not in the Dominican Republic nor in the Bahamas, though it has been suggested through misidentification from both areas by casual students in the recent literature.

We consider the following two varieties worthy of validation botanically at this point in our studies:

ONCIDIUM LEIBOLDII Rchb.f. var. ALBUM Moir & Hawkes, var. nov.

Differt a forma typica planta dimidia, foliis tenuis erectis, habitu compactis. Floribus albis, in crista labello flava ornata.

Plant half as large as typical species, the leaves even more slender and more erect, and the habit more compact. Flowers similar in size to typical species, pure white, except for some yellow on the crest of the labellum.

CUBA: Precise locality unknown. Flowering in cultivation, Honolulu, 1967, Moir s.n. (Type in Herbarium of Bishop Museum).

ONCIDIUM LEIBOLDII Rchb.f. var. MAJUS Moir & Hawkes, var. nov.

Differt a forma typica planta bis majoribus, maculis floribus plus intensis.

Plant twice the dimensions of the typical species, the leaves exceptionally sharp-pointed. Inflorescences numerous, many-flowered. Flowers somewhat larger than those of the typical species, the brown markings on the segments of more intense hue.

HABITAT UNKNOWN: Flowering in cultivation, Honolulu, 1966, Moir s.n. (Type in Herbarium of Bishop Museum).

ONCIDIUM x SANCTAE - ANAE Moir & Hawkes, nat. hybr.
nov. (O. berenycce Rchb.f. X O. pulchellum Hk.)

Habitu inter parentiis intermedium, floribus intermediis, variabilis.

Pseudobulbs absent. Growth compact as in both parents. Leaves with high development of anthocyanin, giving them a purple-green hue, fleshy, lanceolate, rounded in cross-section, acute, canaliculate, somewhat complicate, slightly denticulate, up to 12 cm long and 1 cm broad. Inflorescence 30 - 80 cm long, pendent, racemose at first, paniculate on second flowering near plant; floral bracts triangular, up to 3 mm long; pedicels with ovary to 2 cm long. Flowers 3 cm long, 2 cm broad, the sepals and petals rose to ruby-colored, with lavender sheen and brownish shading, the lip lavender-rose, strongly veined in deeper color to with a mask either white with orange dots or brown with reddish dots. Sepals clawed, lanceolate, the apex concave, acute, 7 - 8 mm long and 2 - 3 mm broad, the dorsal narrower than the synsepal formed by the two lateral sepals. Petals clawed, ovate, obtuse, the margins strongly crenulate, 8 mm long and 4 mm broad. Lip strongly 4-lobed, the lateral lobes rounded, obtuse, retrorse, breadth of lip across these lobes 1.5 - 2 cm; isthmus 1 cm or less, tapered, the margins sometimes denticulate; anterior lobes (midlobe) large, reniform, slightly concave, slightly projected forward, apically deeply emarginate, the margins undulate, 3 cm long and 3 cm broad; crest 7-parted, the tubercles more blunt than in those of O. berenycce Rchb.f. and paler yellow than in that parent species, otherwise much like it. Column-wings ample, apically acute, semi-falcate, crenulate, rose- to violet-colored.

JAMAICA: Near Brownstown, epiphyte in dry deciduous forests in a belt with rainfall averaging less than 75 inches per annum, alt. 1500 - 2000 feet, 1955, flowering in cultivation, Honolulu, 1967, Moir s.n. (Type in Herbarium of Bishop Museum).

Repeated collections in St. Ann Parish, coupled with repeat-

ed hybridization between O. pulchellum Hk. and O. berenyce Rchb.f. under cultivation at "Lipolani" in Honolulu have produced consistent, identical flowers of this singularly attractive natural hybrid Oncidium.

ONCIDIUM x WITHNERIANUM Moir, nat. hybr. nov. (O. berenyce Rchb.f. X O. tetrapetalum (Jacq.) Willd.)

Habitu inter parentiis intermedium, floribus intermediis, variabilis.

Pseudobulbs absent. Growth compact as in both parents, highly anthocyanic. Leaves semi-terete, canaliculate, lanceolate, acute, to 12 cm long. Inflorescence pendent, 30 cm long or less, racemose, few- to many-flowered; floral bracts small, triangular; pedicellate ovary to 1.5 cm long. Flowers measuring 2 cm X 1.2 cm, the sepals and petals pale pink with brown markings, the lip pale pink, the isthmus covered with a mask of brown and pink. Sepals slightly clawed, lanceolate, acute, the dorsal 7 - 8 mm long and 3 mm broad, 2-apiculate. Petals slightly clawed, ovate, obtuse, the margins lightly crenulate, 8 mm long, to 4 mm broad near apex. Lip 4-lobed, the lateral lobes small, obtuse; isthmus broad, tapering from lateral lobes to base below crest, sometimes denticulate; anterior lobes reniform, with emarginate apex, 2 cm across and 1.5 cm long; crest 7-parted, the tubercles not as sharp-pointed as in O. berenyce Rchb.f. Column-wings semi-falcate, pink to violet in color.

JAMAICA: Near Brownstown, epiphyte in dry deciduous forests in a belt with rainfall averaging less than 75 inches per annum, alt. 1500 - 2000 feet, 1955, flowering in cultivation, Honolulu, 1967, Moir s.n. (Type in Herbarium of Bishop Museum).

This is one of many hybrids, along with O. x jamaicense Moir & Hawkes and O. x sanctae-anae Moir & Hawkes, supra, to be encountered in the vicinity of Brownstown, St. Ann Parish, Jamaica, where the three component species — Oncidium berenyce Rchb.f., O. pulchellum Hk., and O. tetrapetalum (Jacq.) Willd. — until recent years occurred in great numbers.

The new natural hybrid is named for Carl L. Withner, of Brooklyn College, who has uniquely published on the Equitant Oncidiums in recent years.

ADDITIONAL MATERIALS TOWARD A MONOGRAPH OF THE GENUS
CALLICARPA. VII

Harold N. Moldenke

CALLICARPA L.

Additional synonymy: Callicarppa Mak. apud Liu, Illustr. Nat. & Introd. Lign. Pl. Taiwan 2: 1208, sphalm. 1962.

Additional & emended bibliography: J. Matsum., Bot. Mag. Tokyo 3: 318. 1889; A. S. Hitchc., Ann. Rep. Mo. Bot. Gard. 4: 118. 1893; C. B. Clarke in J. Schmidt, Bot. Tidsskr. 26: 171--172. 1904; Shirasawa, Nippon Shinrin Jumoku [Icon. Ess. Forest. Jap.] 2: pl. 70, fig. 1--27. 1908; Yabe, Indust. Mat. Bur. Agr. S. Wanch. Ry. Co. 12: [Fl. Tsingtau] 96. 1919; Nakai, Trees & Shrubs Indig. Jap., ed. 1, 336. 1922; L. H. Bailey, Man. Cult. Pl., ed. 1, pr. 1, 633 & 804 (1924) and pr. 2, 633 & 804. 1925; Makino & Tanaka, Man. Fl. Nipp. fig. 137. 1927; Terasaki, Nippon Shokubutsu Zufu [Jap. Bot. Illustr. Album] fig. 1592. 1933; Tu, Chinese Bot. Dict., abrdg. ed., 310 & 1103. 1933; L. H. Bailey, Man. Cult. Pl., ed. 1, pr. 3, 633 & 804. 1938; Makino, Ill. Fl. Nippon fig. 560. 1940; L. H. Bailey, Man. Cult. Pl., ed. 1, pr. 4, 633 & 804 (1941), pr. 5, 633 & 804 (1944), and ed. 2, 844 & 1045. 1949; E. H. Walker, Bibliog. East. Asiat. Bot. Suppl. 1: 235. 1960; Diaconescu, Lucra. Grad. Bot. Bucarest. [Act. Bot. Hort. Bucarest.] 1960: 361--363. 1960; Liu, Illustr. Nat. & Introd. Lign. Pl. Taiwan 2: 1202--1212, pl. 1010--1020. 1962; Rolla, Bull. Bot. Surv. India 5: 188 & 205. 1963; Srinivasan & Agarwal, Bull. Bot. Surv. India 5: 86. 1963; Deb, Bull. Bot. Surv. India 5: 53. 1963; H. L. Hoffman, Castanea 29: 31. 1964; T. A. Rao, Bull. Bot. Surv. India 6: 47, 48, & 54. 1964; Balakrishnan, Bull. Bot. Surv. India 6: 82 & 86--87. 1964; Panigrahi, Chowdhury, Raju, & Deka, Bull. Bot. Surv. India 6: 239 & 255. 1964; Sen & Naskar, Bull. Bot. Surv. India 7: 38. 1965; E. E. Lord, Shrubs & Trees Austral. Gard., rev. ed., 250. 1964; Rao & Joseph, Bull. Bot. Surv. India 7: 139 & 149. 1965; Mukerjee, Bull. Bot. Surv. India 7: 135. 1965; Rodgers & Shake, Castanea 30: 163. 1965; J. E. Moore, Castanea 30: 26. 1965; Reese & Thieret, Castanea 31: 253 & 274. 1966; Kawazu & Mitsui, Tetrahedron Lett. 30: 3519--3524. 1966; J. S. Beard, Descrip. Cat. W. Austr. Pl. 91. 1966; Anon., Biol. Abstr. 47 (21): S.28 & S.166. 1966; Hellyer, Shrubs in Colour 20--[21]. 1966; Moldenke, Phytologia 14: 218--256. 1967; Wayside Gardens [Cat.] 1967: 140 & 224. 1967; Mellinger, Castanea 31: 311. 1967; Van Steenis-Kruseman, Fl. Males. Bull. 4: L. 1967.

The Makino & Tanaka (1927) reference cited above is sometimes cited as "Fl. Jap. fig. 137. 1928", but the publication is not so listed by Walker in his classic Bibliography of Eastern Asiatic Botany (1960).

CALLICARPA ACUMINATA H.B.K.

Additional bibliography: Moldenke, *Phytologia* 14: 219. 1967.

Barr describes this plant as a "shrub with bright-green foliage", fruiting in October; King reports it as "not common" in Oaxaca, growing in loam in open sun. The corollas are described as "white" on R. M. King 900 and as "cream-white" on King, Guevara, & Forero-G. 6018. There is a wood voucher accompanying the last-mentioned collection.

Additional citations: MEXICO: Oaxaca: R. M. King 900 (Mi). Vera Cruz: R. J. Barr 63-537 [W. E. Niles 265] (Du--506323). GUATEMALA: Alta Verapaz: R. M. King 3354 (Du--445340). COLOMBIA: Tolima: King, Guevara, & Forero-G. 6018 (W--2466996).

CALLICARPA AMERICANA L.

Additional bibliography: L. H. Bailey, *Man. Cult. Pl.*, ed. 1, pr. 1, 633 & 804 (1924), pr. 2, 633 & 804 (1925), pr. 3, 633 & 804 (1938), pr. 4, 633 & 804 (1941), pr. 5, 633 & 804 (1944), and ed. 2, 844 & 1045. 1949; H. L. Hoffman, *Castanea* 29: 31. 1964; E. E. Lord, *Shrubs & Trees Austral. Gard.*, rev. ed., 250. 1964; J. E. Moore, *Castanea* 30: 26. 1965; Rodgers & Shake, *Castanea* 30: 163. 1965; Reese & Thieret, *Castanea* 31: 253 & 274. 1966; Mellinger, *Castanea* 31: 311. 1967; Moldenke, *Phytologia* 14: 219--220 & 255. 1967.

Duncan describes this plant as 8 feet tall, with a broad rounded crown, the corolla pink-purple, and the anthers yellow, growing in generally open areas beneath dense live oak woods. Rodgers & Shake (1965) report the species as "occasional near streams" in Transylvania County, North Carolina, and Oconee County, South Carolina; Mellinger (1967) describes it as an associate of Pinckneya pubens in Effingham County, Georgia; while Reese & Thieret (1966) report it from the Five Islands in Iberia and Saint Mary Parishes, Louisiana, where it grows with Ilex vomitoria as the conspicuous understory in woods of Carya species, Magnolia grandiflora, and Quercus virginiana on relatively well-drained flat to sloping forested areas. Lord (1964) records it as cultivated in Australia.

Additional citations: GEORGIA: Sapelo Island: W. H. Duncan 20155 (S). FLORIDA: Monroe Co.: A. R. Moldenke 1387 (Rf). LOUISIANA: Evangeline Par.: Ewan 19342 (Rf). TEXAS: Cass Co.: Harris & Roach 249 (Du--355203).

CALLICARPA AMERICANA var. LACTEA F. J. Muller

Additional synonymy: Callicarpa americana f. alba Ewan, in herb.

Additional bibliography: L. H. Bailey, *Man. Cult. Pl.*, ed. 1, pr. 1, 633 (1924), pr. 2, 633 (1925), pr. 3, 633 (1938), pr. 4, 633 (1941), pr. 5, 633 (1944), and ed. 2, 844 & 1045. 1949; Moldenke, *Phytologia* 13: 470 & 494--497. 1966.

Ewan describes the fruit of the variety as "snow-white" and reports the plant growing with the usual form near St. Landry, about

one mile northeast of Chilcot State Park, collected on September 13, 1958.

Additional citations: LOUISIANA: Evangeline Par.: Ewan 19360 (Z).

CALLICARPA ANGUSTA Schau.

Additional bibliography: Moldenke, Phytologia 14: 220 & 225 (1967) and 15: 17 & 19. 1967.

This plant has been collected in anthesis in February, July to October, and in December, and in fruit from December to March. Material has been misidentified and distributed in herbaria under the name C. canna L. On the other hand, the Ahern 811 [25] and Loher 4444, distributed as C. angusta, are actually C. bicolor A. L. Juss., Ahern 662 is C. formosana Rolfe, and Foxworthy s.n. [Herb. Philip. Bur. Sci. 719] is C. rivularis Merr. The Kollman s.n. [Java, 1838], previously referred to typical C. longifolia Lam., is actually C. longifolia f. floccosa Schau. The E. D. Merrill 441, cited below, was previously incorrectly cited by me as C. erioclona Schau.

Additional citations: WESTERN PACIFIC ISLANDS: PHILIPPINE ISLANDS: Culi6n: E. D. Merrill 441 (N, W--435411). Luzon: Ahern's collector s.n. [Herb. Philip. Forest. Bur. 1888] (W--625970); M. Ramos s.n. [Herb. Philip. Bur. Sci. 1030] (W--626451), s.n. [Herb. Philip. Bur. Sci. 7724] (W--629299); Ramos & Edaño s.n. [Herb. Philip. Bur. Sci. 26367] (W--1375174); Reillo s.n. [Herb. Philip. Bur. Sci. 19265] (W--900601). Mindoro: Merritt s.n. [Herb. Philip. Forest. Bur. 8788] (W--709166).

CALLICARPA ANOMALA Ridl.

Additional bibliography: Moldenke, Phytologia 13: 501. 1966.

The identity of this plant has now been established. The name is a synonym of Geunsia anomala Ridl. The taxon is to be excluded from Callicarpa.

CALLICARPA ARBOREA Roxb.

Additional bibliography: Rolla, Bull. Bot. Surv. India 5: 188 & 205. 1963; Balakrishnan, Bull. Bot. Surv. India 6: 87. 1964; Panigrahi, Chowdhury, Raju, & Deka, Bull. Bot. Surv. India 6: 239 & 255. 1964; Mukerjee, Bull. Bot. Surv. India 7: 135. 1965; Rao & Joseph, Bull. Bot. Surv. India 7: 139 & 149. 1965; Sen & Naskar, Bull. Bot. Surv. India 7: 38. 1965; Moldenke, Phytologia 14: 220, 235, 243, 245, & 246. 1967.

Boesa found this plant growing in marsh land and swamp forest in Sumatra. Mukerjee (1965) states that C. arborea, along with Macaranga denticulata Muell.-Arg. and Trema orientalis Wall., are the most invasive trees on the savannas of the Jalpaiguri district of West Bengal. Rao & Joseph (1965) tell us that it is found in the tropical and subtropical evergreen forests of Hopea, Terminalia, and Dipterocarpus in the Northeast Frontier Agency of India. Rolla

(1963) reports that C. arborea grows in the subtropical 900--1800 m. association with Phoebe, Castanopsis, and Lagerstroemia. Panigrahi and his associated authors (1964) record it from Orissa. The corollas are described as "lavender-pink" on M. S. Clemens 10788.

Material of C. arborea has been misidentified and distributed in herbaria under the name C. magna Schau.

Additional citations: WESTERN PACIFIC ISLANDS: PHILIPPINE ISLANDS: Mindanao: M. S. Clemens 1156 (W--709630). Paragua: E. D. Merrill 801 (W--435771). INDONESIA: GREATER SUNDA ISLANDS: Sumatra: H. H. Bartlett 6448 (Mi, W--1551599); Bartlett & LaRue 361 (W--1053957); Boeea 8244 (Mi); Krukoff 349 (W--1702650); Toroos 1045 (Mi), 3646 (W--1675892), 4364 (W--1676350). MELANESIA: NEW GUINEA: Northeastern New Guinea: M. S. Clemens 10788 (Mi), 10870 P (Mi).

CALLICARPA ARBOREA var. PSILOCALYX (H. J. Lam) Moldenke

Additional bibliography: Moldenke, *Phytologia* 14: 37 & 40--42 (1966) and 14: 220. 1967.

Additional citations: WESTERN PACIFIC ISLANDS: PHILIPPINE ISLANDS: Luzon: H. M. Curran s.n. [Herb. Philip. Forest. Bur. 17181] (W--709916); Elmer 9125 (W--705119), 17575 (W--1237180); M. Ramos 395 (W--1178293); Sulit s.n. [Philip. Nat. Herb. 37503] (W--2376635).

CALLICARPA BASILANENSIS Merr.

Additional bibliography: Moldenke, *Phytologia* 14: 44--45. 1966.

This plant has been found growing in pasture land, flowering in May and August. Santos reports the trunk as 5 inches in diameter, the calyx as "light green, yellow", and the corolla as "light-purple".

Additional citations: WESTERN PACIFIC ISLANDS: PHILIPPINE ISLANDS: Basilan: W. I. Hutchinson s.n. [Herb. Philip. Forest. Bur. 6124] (W--706277--cotype); Reillo s.n. [Herb. Philip. Bur. Sci. 15450] (W--714884); J. V. Santos 4172 (W--2246049). Mindanao: Ramos & Edaffo s.n. [Herb. Philip. Bur. Sci. 36737] (W--1260153); C. B. Robinson s.n. [Herb. Philip. Bur. Sci. 11831] (W--714485).

CALLICARPA BASITRUNCATA Merr.

Additional bibliography: E. H. Walker, *Bibliog. East. Asiat. Bot. Suppl.* 1: 235. 1960; Moldenke, *Phytologia* 14: 45--46. 1966.

CALLICARPA BICOLOR A. L. Juss.

Additional bibliography: Moldenke, *Phytologia* 14: 220 & 225 (1967) and 15: 15 & 19. 1967.

Rogerson describes this plant as a shrub or small tree, 6--10 feet tall. It has been found in anthesis in April, June, and July in addition to the months previously reported, and in fruit

in June. The corollas are described as "lilac" on C. T. Rogerson 1016. Material has been misidentified and distributed in herbaria as C. angusta Schau. and as C. erioclona Schau. The Ahern's collector s.n. [Herb. Philip. Forest. Bur. 1484], Elmer 18086, R. C. McGregor s.n. [Herb. Philip. Bur. Sci. 1241], and Robinson & Merritt s.n. [Herb. Philip. Bur. Sci. 6124], cited below, were previously incorrectly cited by me as C. erioclona Schau. On the other hand, the Bermejosi s.n. [Herb. Philip. Bur. Sci. 1534], distributed as C. bicolor, is actually the type collection of var. bermejosi Moldenke.

Additional citations: WESTERN PACIFIC ISLANDS: PHILIPPINE ISLANDS: Bohol: R. C. McGregor s.n. [Herb. Philip. Bur. Sci. 1241] (N, W—439220), Cebu: J. V. Barrow s.n. [Cebu, 1904] (W—628538). Luzon: Ahern 811 (W—445880); Ahern's collector s.n. [Herb. Philip. Forest. Bur. 1484] (Bz—17264, N, W—625934); Elmer 18086 (Bz—17460, Ca—270774, N, Ut—67298, W—1237553); Loher 4444 (W—446885); E. D. Merrill 2715 (W—437683), 3442 (W—438424); Robinson & Merritt s.n. [Herb. Philip. Bur. Sci. 6124] (N, W—627638); C. T. Rogerson 1016 (W—1940693). Mindanao: DeVore & Hoover 175 (W—449406). Negros: E. D. Merrill 207 (W—1133075).

CALLICARPA BICOLOR var. BERMEJOSI Moldenke

Bibliography: Moldenke, Phytologia 14: 398--399. 1967.

This variety differs from the typical form of the species in having its leaf-blades oblong-lanceolate or oblong, 13—18 cm. long, 3—5 cm. wide, conspicuously long-acuminate at both ends, and subentire or obscurely sinuate-crenate along the margins.

The type of the variety was collected by J. Bermejosi — in whose honor it was named — at Bulalacao, Mindoro, Philippine Islands, in August or September, 1906, and is deposited in the United States National Herbarium at Washington. The plant has been found in fruit in September, and herbarium material has been misidentified and distributed in herbaria under the name C. cana L.

Citations: WESTERN PACIFIC ISLANDS: PHILIPPINE ISLANDS: Coron: M. Ramos s.n. [Herb. Philip. Bur. Sci. 41148] (W—1261818). Mindoro: Bermejosi s.n. [Herb. Philip. Bur. Sci. 1534] (N—isotype, W—439473—type, Z—isotype).

CALLICARPA BICOLOR var. SUBINTEGRIFOLIA Moldenke

Bibliography: Moldenke, Phytologia 14: 399. 1967.

This variety differs from the typical form of the species in having the margins of its leaf-blades entire or subentire.

The type of the variety was collected by Jacinto Ramos at Pangil, in Laguna Province, Luzon, Philippine Islands, on May 27, 1959, and is deposited in the United States National Herbarium at Washington. It was originally misidentified and distributed in herbaria as C. formosana Rolfe.

Citations: WESTERN PACIFIC ISLANDS: PHILIPPINE ISLANDS: Luzon:

J. Ramos s.n. [Philip. Nat. Herb. 39880] (W--2376580--type, Z--isotype).

CALLICARPA BODINIERI L  veill  

Additional synonymy: Callicarpa bodineiri Lord, Shrubs & Trees Austral. Gard., rev. ed., 250, sphalm. 1964.

Additional bibliography: L. H. Bailey, Man. Cult. Pl., ed. 2, 844 & 1045. 1949; E. E. Lord, Shrubs & Trees Austral. Gard., rev. ed., 250. 1964; Hellyer, Shrubs in Colour 20--[21]. 1966; Moldenke, Phytologia 14: 220--221, 225, & 255. 1967; Wayside Gardens [Cat.] 1967: 140. 1967.

The R. C. Ching 5666 and How 71071 cited by me in Phytologia 14: 60 (1966) are actually C. japonica var. angustata Rehd. (as stated by me on the preceding page of that paper). The MacDaniels s.n. [West Hill, Ithaca, July 10, 1940], Rehder s.n. [E. H. Wilson 633] & s.n. [Arnold Arb., Aug. 8, 1919], and Sears s.n. [Arnold Arb. 6712-1-A], distributed originally as C. bodinieri var. giraldii, are actually C. japonica var. angustata Rehd. The Fang 4648, cited below, was previously incorrectly cited by me as var. giraldii (Hesse) Rehd.

Additional citations: CHINA: Szechuan: Fang 4648 (Du--252638).

CALLICARPA BODINIERI var. GIRALDII (Hesse) Rehd.

Additional synonymy: Callicarpa bodineiri giraldii Lord, Shrubs & Trees Austral. Gard., rev. ed., 250, sphalm. 1964.

Additional bibliography: Hand.-Mazz., Ann. Hort. Gothenb. 9: [67], 1934; L. H. Bailey, Man. Cult. Pl., ed. 2, 844 & 1045. 1949; E. E. Lord, Shrubs & Trees Austral. Gard., rev. ed., 250. 1964; Hellyer, Shrubs in Colour 20--[21]. 1966; La Montagne, Bull. Soc. Nat. Hort. France 1966: 381. 1966; Moldenke, Phytologia 14: 220--221, 225, & 255. 1967; Wayside Gardens [Cat.] 1967: 140. 1967.

Additional illustrations: Hellyer, Shrubs in Colour 20 & [21]. 1966; Wayside Gardens [Cat.] 1967: 140 [in color]. 1967.

In the Wayside Gardens reference cited above (1967) this plant is described as follows: "Gracefully recurving branches, covered in August with thousands of closely set, small, pink tinted flowers. These are followed in late September by masses of violet-purple berries which last until midwinter. There are few shrubs which give as much pleasure in the garden or which are so satisfactory for cutting. Ultimate height about five feet. We offer nice plants about 18 to 24 inches tall that will bear fruit at once" for \$3.25 each, \$9.25 for three, or \$33.50 per dozen. It is called "Violet Jewel Berry". Lord (1964) records it as cultivated in Australia.

The Fang 4648 cited by me in a previous installment of these notes is better regarded as typical C. bodinieri L  veill  .

CALLICARPA BODINIERI var. LYI (L  veill  ) Rehd.

Additional bibliography: Moldenke, Phytologia 14: 51 & 60--61.

1966.

CALLICARPA BODINIERI var. ROSTHORNII (Diels) Rehd.Additional bibliography: Moldenke, Phytologia 14: 62. 1966.The Ching 5666, distributed as this variety, is actually C. japonica var. angustata Rehd.CALLICARPA BREVIPIES (Benth.) HanceAdditional bibliography: Moldenke, Phytologia 14: 221 & 255. 1967.The Weiss 1705, distributed as this species, is actually C. japonica var. angustata Rehd.CALLICARPA BREVIPETIOLATA Merr.Additional bibliography: Moldenke, Phytologia 14: 221. 1967.

In addition to the months previously recorded, this plant has been found in fruit in June. Boesa records the additional vernacular names "doehoet poene", "mata poene", "si marmata-ni-poene", and "si marpoene-poene". The note appended by someone on the H. H. Bartlett 7408 & 7527 specimens in the University of Michigan herbarium, to the effect that the scientific name of the species was "ined." in 1966, is entirely incorrect. The name was validly published by Merrill in 1919.

Additional citations: INDONESIA: GREATER SUNDA ISLANDS: Sumatra: H. H. Bartlett 7408 (M1, W--1429475), 7441 (M1), 7527 (M1, W--1429527); Boesa 7402 (M1, W--1682102), 7592 (M1), 7752 (M1), 8017 (M1), 9002 (M1); Toroos 1220 (M1); H. S. Yates 1563 (W--1551289).

CALLICARPA CANDICANS (Burm. f.) Hochr.Additional synonymy: Callicarpa canna L., in herb.

Additional & emended bibliography: C. B. Clarke in J. Schmidt, Bot. Tidsskr. 26: 171--172. 1904; Sen & Naskar, Bull. Bot. Surv. India 7: 38. 1965; Kawazu & Mitsui, Tetrahedron Lett. 30: 3519--3524. 1966; J. S. Beard, Descrip. Cat. W. Austr. Pl. 91. 1966; Anon., Biol. Abstr. 47 (21): S.28. 1966; Moldenke, Phytologia 14: 221, 225, 238, 244, & 245 (1967) and 15: 15. 1967.

Kawazu & Mitsui (1966) report on the extraction of a fish-killing compound, callicarpone, from this plant. An additional vernacular name for the plant reported by Hasskarl (1844) is "katoempang", a name applied also to C. longifolia Lam. and to C. pedunculata R. Br.

The E. D. Merrill 441, distributed as C. candicans, is actually C. angusta Schau.; Ahern's collector s.n. [Herb. Philip. Bur. Sci. 1484], DeVore & Hoover 175, R. C. McGregor s.n. [Herb. Philip. Bur. Sci. 1241], Robinson & Merritt s.n. [Herb. Philip. Bur. Sci. 6124], and C. T. Rogerson 1016 are C. bicolor A. L. Juss.; M. Ramos s.n. [Herb. Philip. Bur. Sci. 41148] is C. bicolor var. bermejosi Moldenke; Fénix s.n. [Herb. Philip. Bur. Sci. 29884], Loher 4443,

H. N. Whitford 569, and Wilkes s.n. [Manilla] are C. erioclona Schau.; C. C. Y. Wong 326 is C. erioclona f. glabrescens Moldenke [not var. paucinervia as stated previously]; Kanehira 2203, G. C. Moore 339, W. L. Necker R.24, and Rodin 599 are C. erioclona var. paucinervia (Merr.) Moldenke; and Bañaga s.n. [Philip. Nat. Herb. 33393] is C. formosana Rolfe.

CALLICARPA CANDICANS var. SUMATRANA (Miq.) Moldenke

Additional bibliography: C. B. Clarke in J. Schmidt, Bot. Tidskr. 26: 171—172. 1904; Moldenke, Phytologia 14: 221. 1967.

CALLICARPA CAUDATA Maxim.

Additional bibliography: Moldenke, Phytologia 14: 221—222 & 228—230. 1967.

Williams refers to the fruit of this plant as bluish-purple. It has been found flowering also in February and fruiting in May and October.

The Elmer 10375 and E. D. Merrill 7115, distributed as C. caudata, are actually C. merrillii Moldenke, a species to which this one is very closely related.

Additional citations: WESTERN PACIFIC ISLANDS: PHILIPPINE ISLANDS: Benguet: Loher 4440 (W—446882). Luzon: P. T. Barnes s.n. [Herb. Philip. Forest. Bur. 924] (W—625102); Canicosa s.n. [Herb. Philip. Forest. Bur. 30020] (W—1527566); Elmer 5784 (W—853014), 5870 (W—853090), 8646 (W—854684); E. D. Merrill 4613 (W—710373); M. Ramos s.n. [Herb. Philip. Bur. Sci. 27044] (W—1376040); Ramos & Edayo s.n. [Herb. Philip. Bur. Sci. 37481] (W—1292135), s.n. [Herb. Philip. Bur. Sci. 38025] (W—1292209), s.n. [Herb. Philip. Bur. Sci. 40505] (W—1261518); R. S. Williams 1060 (W—707363). Mindanao: Elmer 11333 (W—779529).

CALLICARPA CAULIFLORA Merr.

Additional bibliography: Moldenke, Phytologia 14: 144—145 (1966) and 14: 247. 1967.

This species has been collected in fruit in December.

Additional citations: WESTERN PACIFIC ISLANDS: PHILIPPINE ISLANDS: Leyte: M. Ramos s.n. [Herb. Philip. Bur. Sci. 41540] (W—1261993).

CALLICARPA CRASSINERVIS Urb.

Additional bibliography: Moldenke, Phytologia 14: 222 & 232. 1967.

CALLICARPA CUNEIFOLIA Britton & P. Wils.

Additional bibliography: Moldenke, Phytologia 14: 222 & 232. 1967.

CALLICARPA DICHOTOMA (Lour.) K. Koch

Additional bibliography: Hayata, Journ. Coll. Sci. Univ. Tokyo

30 (1): [Mater. Fl. Formos.] 222. 1911; L. H. Bailey, Man. Cult. Pl., ed. 1, pr. 1, 633 & 804 (1924) and pr. 2, 633 & 804. 1925; Hand.-Mazz., Ann. Hort. Gothenb. 9: [67]. 1934; L. H. Bailey, Man. Cult. Pl., ed. 1, pr. 3, 633 & 804 (1938), pr. 4, 633 & 804 (1941), pr. 5, 633 & 804 (1944), and ed. 2, 844 & 1045. 1949; Liu, Illustr. Nat. & Introd. Lign. Pl. Taiwan 2: 1203, pl. 1011. 1962; E. E. Lord, Shrubs & Trees, Austral. Gard., rev. ed., 250. 1964; Hellyer, Shrubs in Colour 20. 1966; Moldenke, Phytologia 14: 222, 223, 225, 249, & 254—256. 1967.

Additional illustrations: Liu, Illustr. Nat. & Introd. Lign. Pl. Taiwan 2: pl. 1011. 1962.

Liu (1962) recommends the common name "purple beauty-berry" for this species. Mizushima describes the plant as a bush, 2 m. tall, the branches of the year and the young leaves tinged with violet, growing in swamps. Lord (1964) records the species as cultivated in Australia, with "deep-lilac berries".

The R. C. Ching 6130, distributed as C. dichotoma, is actually C. japonica f. albiflora Moldenke, while I. R. Jones 637-25 is C. japonica var. angustata Rehd. and Ramos & Edaño s.n. [Herb. Philip. Bur. Sci. 49011] cited by Bakhuizen van den Brink is actually C. phanerophlebia Merr.

Additional citations: JAPAN: Honshiu: Mizushima 17216 (S).
CULTIVATED: New Jersey: H. N. Moldenke s.n. [Somerset, 1930] (Bu).

CALLICARPA DOLICHOPHYLLA Merr.

Additional bibliography: Moldenke, Phytologia 14: 170—172. 1966.

This species has been found flowering in May and July.

Additional citations: WESTERN PACIFIC ISLANDS: PHILIPPINE ISLANDS: Luzon: M. Ramos s.n. [Herb. Philip. Bur. Sci. 1063] (W—626482), s.n. [Herb. Philip. Bur. Sci. 8268] (W—629417).

CALLICARPA ELEGANS Hayek

Additional synonymy: Callicarpa eiegans Hagek., in herb.
Callicarpa elegens Hayek, in herb.

Additional bibliography: Hayata, Journ. Coll. Sci. Univ. Tokyo 30 (1): [Mater. Fl. Formos.] 222. 1911; Moldenke, Phytologia 14: 222, 225, & 255. 1967.

This plant has been found flowering also in June and fruiting in August; the flowers on R. S. Williams 340 are described as "pinkish-white". Hayek's surname is sometimes misspelled "Hagek.", "Hayak.", or "Hayet." in herbaria. Merrill suggests that the Herb. Philip. Bur. Sci. 29137 collection, cited below, represents a "var." of this species, but I can see no essential distinguishing characters.

The Ramos & Edaño s.n. [Herb. Philip. Bur. Sci. 45614], cited below, was originally misidentified and distributed to herbaria as C. micrantha Vidal, cited by Bakhuizen van den Brink as C. pedunculata R. Br., and previously cited by me as C. formosana var. glabrescens Moldenke.

Additional citations: WESTERN PACIFIC ISLANDS: PHILIPPINE ISLANDS: Leyte: Edaño s.n. [Herb. Philip. Bur. Sci. 41674] (W--1262068). Luzon: Loher 4446 (W--446886); Merritt & Darling s.n. [Herb. Philip. Forest. Bur. 13994] (W--711492); Otanés s.n. [Herb. Philip. Bur. Sci. 17792] (W--1238526), s.n. [Herb. Philip. Bur. Sci. 17851] (W--1010580); M. Ramos s.n. [Herb. Philip. Bur. Sci. 4815] (W--626250), s.n. [Herb. Philip. Bur. Sci. 7054] (W--629148), s.n. [Herb. Philip. Bur. Sci. 22310] (W--898402), s.n. [Herb. Philip. Bur. Sci. 27662] (W--1376039), s.n. [Herb. Philip. Bur. Sci. 33146] (W--1263282); Ramos & Edaño s.n. [Herb. Philip. Bur. Sci. 29137] (W--1376037), s.n. [Herb. Philip. Bur. Sci. 45614] (Bz--18140, N); R. S. Williams 340 (W--706954). Mindanao: Ramos & Edaño s.n. [Herb. Philip. Bur. Sci. 49011] (W--1527938). Sibuyan: Elmer 12144 (W--779777). PALAU ISLANDS: Koror: Herre 53 (Du--337163), 66 (Du--337156), Makarakol: Hosokawa 9273 (W--2036568). MICRONESIA: CAROLINE ISLANDS: Auluptagel: Hosokawa 7454 (W--2036371). Corol: Kanehira 1995 (W--1656935).

CALLICARPA ERIOCLONA Schau.

Additional synonymy: Callicarpa eriocloma Schau., in herb.

Additional bibliography: Moldenke, Phytologia 14: 175--184 (1966), 14: 222, 241, & 243--245 (1967), and 15: 15, 17, & 20. 1967.

Foxworthy describes this plant as a tree, 5 m. tall, the trunk 7 cm. in diameter at breast height, the leaves silvery beneath, and the (immature) fruit pale-green. Herre describes it as a low shrub. The corollas are described as "nearly white" on R. S. Williams 2964 and as "pink" on Herre 17 and M. L. Steiner 418. The species has been found in flower in January; the fruit is described as purplish. Foxworthy found it growing in "forest valley", while Lambert & Brunson aver that it is "not commercial".

The Ahern's collector s.n. [Herb. Philip. Forest. Bur. 1484], Robinson & Merritt s.n. [Herb. Philip. Bur. Sci. 6124], Elmer 18086, and R. C. McGregor s.n. [Herb. Philip. Bur. Sci. 1241] previously cited by me as C. erioclona are actually C. bicolor A. L. Juss.

Additional citations: WESTERN PACIFIC ISLANDS: PHILIPPINE ISLANDS: Bohol: M. Ramos s.n. [Herb. Philip. Bur. Sci. 42770] (W--1292438). Catanduanes: Ramos & Edaño s.n. [Herb. Philip. Bur. Sci. 75120] (W--1596218). Luzon: Adduru 150 (W--898632); Ahern's collector s.n. [Herb. Philip. Forest. Bur. 3300] (W--1178548); T. E. Borden s.n. [Herb. Philip. Forest. Bur. 1595] (W--625480); Elmer 15082 (W--894518), 15124 (W--894255), 17598 (W--1237198); Fénix s.n. [Herb. Philip. Bur. Sci. 29884] (W--1376036); Foxworthy 13 (W--1091588), 18 (W--1091601); Galutera s.n. [Philip. Nat. Herb. 33358] (W--2212413); Kruckeberg & Brown s.n. [August 24, 1945] (Du--454091); Loher 4443 (W--446884), 4449 (W--446887);

R. C. McGregor s.n. [Herb. Philip. Bur. Sci. 22910] (W--898251); E. D. Merrill 2536 (W--437495); M. Ramos s.n. [Herb. Philip. Bur. Sci. 1039] (W--525459), s.n. [Herb. Philip. Bur. Sci. 8176] (W--629392); Ramos & Edaño s.n. [Herb. Philip. Bur. Sci. 26417] (W--1264942); M. L. Steiner 418 (W--2376453); H. N. Whitford 487 (W--851635), 569 (W--851679), s.n. [Herb. Philip. Forest. Bur. 19757] (W--900111); Wilkes s.n. [Manilla] (W--40651). MINDANAO: Ahern 540 (W--445820); Elmer 11190 (W--779478); Quadras 335 (W--1584708); R. S. Williams 2964 (W--708188). MINDORO: Lambert & Brunson 69 (W--1862388); E. D. Merrill 1667 (W--436618), 2245 (W--437194). PALAU ISLANDS: Koror: Herre 17 (Du--336915). INDONESIA: GREATER SUNDA ISLANDS: Banguey: Castro & Melegrito 1714 (W--1349684). Celebes: C. B. Robinson 2465 (W--775429). MICRONESIA: CAROLINE ISLANDS: Ponape: Takamatsu 796 [U. S. Geol. Surv. Pollen Coll. 1870] (W--1992671).

CALLICARPA ERIOCLONA f. GLABRESCENS Moldenke

Additional bibliography: Moldenke, Phytologia 14: 181--182 (1966) and 15: 20. 1967.

The C. C. Y. Wong 326 collection, cited below, was previously cited by me as C. erioclona var. paucinervia, but it seems to me now that it is closer to f. glabrescens in its characters.

Additional citations: MICRONESIA: CAROLINE ISLANDS: Truk: Hosokawa 8398 (W--2036496--isotype). Yap: C. C. Y. Wong 326 (W--2092186, Z).

CALLICARPA ERIOCLONA var. PAUCINERVIA (Merr.) Moldenke

Additional bibliography: Moldenke, Phytologia 14: 222 (1967) and 15: 20. 1967.

Rodin describes the flowers of this plant as borne "in small cymes". Bryan found it growing "on sandy flat at foot of limestone cliff under coconut palms". It has been found flowering also in March, and fruiting in July. The corollas on E. H. Bryan Jr. 1142 are described as "pale-lavender" and the fruit as blackish-purple. Fosberg regards this taxon as C. candicans (Burm. f.) Hochr. and has so annotated numerous specimens.

The Kanehira 2203 specimen, cited below, was originally misidentified and distributed in herbaria as Premna gaudichaudii Schau.! On the other hand, the C. C. Y. Wong 326, previously cited by me as C. erioclona var. paucinervia, is probably better placed as f. glabrescens Moldenke.

Additional citations: WESTERN PACIFIC ISLANDS: MARIANA ISLANDS: Guam: E. H. Bryan Jr. 1142 (W--1967418); G. C. Moore 339 (W--1863367); R. V. Moran 4525 (W--2276422); Rodin 599 (W--1968596). Pagan: Kanehira 2203 (W--1967170). Rota: W. L. Necker R.24 (W--1864096).

CALLICARPA FERRUGINEA Sw.

Additional bibliography: Moldenke, *Phytologia* 14: 222 & 231—233. 1967.

CALLICARPA FLOCCOSA Urb.

Additional bibliography: Moldenke, *Phytologia* 14: 187 (1966) and 14: 233. 1967.

CALLICARPA FORMOSANA Rolfe

Additional synonymy: *Callicarpa formosanum* Moldenke apud E. H. Walker, *Bibliog. East. Asiat. Bot. Suppl.* 1: 235, sphalm. 1960.

Additional bibliography: J. Matsum., *Bot. Mag. Tokyo* 13: 114. 1899; E. H. Walker, *Bibliog. East. Asiat. Bot. Suppl.* 1: 235. 1960; Liu, *Illustr. Nat. & Introd. Lign. Pl. Taiwan* 2: 1204, pl. 1012. 1962; Moldenke, *Phytologia* 14: 220—231 (1967) and 15: 15, 17, & 20. 1967.

Additional illustrations: Liu, *Illustr. Nat. & Introd. Lign. Pl. Taiwan* 2: pl. 1012. 1962.

Recent collectors refer to this plant as a slender bush, with medicinal uses [in Luzon], inhabiting uplands, and called "tigao-tigao". The corollas are described as "lilac" on R. S. Williams 115 and "purple" on J. V. Santos 5239. It has been found fruiting also in January. Liu (1962) recommends the common name "Formosan beauty-berry" for the species. Merrill, in a memorandum appended to a sheet of his Sp. Blanc. 637, says "This species is common and widely distributed in the Philippines at low altitudes, and is abundant in the vicinity of Manila where it is locally known as tubang dalag, one of the native names cited by Blanco [for his C. americana]. The name is from tuba (Croton tiglium) and dalag (a mud fish), for the plant has properties similar to those of Croton tiglium in that it is used for stupifying fish. *Callicarpa blancoi* presents considerable variation."

The J. Ramos s.n. [Philip. Nat. Herb. 39880], distributed as C. formosana, is actually the type collection of C. bicolor var. subintegrifolia Moldenke; D. R. Mendoza 1433 [Philip. Nat. Herb. 18495] and Ramos & Edaño s.n. [Herb. Philip. Bur. Sci. 29051] are C. formosana f. angustata Moldenke; Escritor s.n. [Herb. Philip. Bur. Sci. 21155] is the type collection of C. formosana f. parvifolia Moldenke

Additional citations: WESTERN PACIFIC ISLANDS: PHILIPPINE ISLANDS: Bayas: E. B. Copeland 123 (W—850282). Biliran: R. C. McGregor s.n. [Herb. Philip. Bur. Sci. 18597] (W—1238619). Bohol: R. C. McGregor s.n. [Herb. Philip. Bur. Sci. 1239] (W—439218); M. Ramos s.n. [Herb. Philip. Bur. Sci. 42808] (W—1292451). Dinagat: Ramos & Pascasio s.n. [Herb. Philip. Bur. Sci. 35239] (W—1263930). Leyte: Kruckeberg & Brown s.n. [September 9, 1945] (Du—454037). Luzon: Adduru 30 (W—1091722); Amihan 3 [Philip. Nat. Herb. 33376] (W—2212432, W—2212433);

Baflaga s.n. [Philip. Nat. Herb. 33393] (W--2212448); P. T. Barnes s.n. [Herb. Philip. Forest. Bur. 55] (W--626129); H. M. Curran s.n. [Herb. Philip. Forest. Bur. 5140] (W--708615); Elmer 5629 (W--852878), 14352 (W--894517), 17611 (W--1237206); Escritor s.n. [Herb. Philip. Bur. Sci. 21104] (W--900819); Foxworthy s.n. [Herb. Philip. Bur. Sci. 12235] (W--714171); Lete 252 (W--1264306); Loher 4441 (W--446883); E. D. Merrill 145 (W--435145), 2522 (W--437480), 2688 (W--437655); R. C. McGregor s.n. [Herb. Philip. Bur. Sci. 19792] (W--568387); R. Meyer s.n. [Herb. Philip. Forest. Bur. 2520] (W--852439); Ocampo s.n. [Herb. Philip. Bur. Sci. 27980] (W--1376379); Otanes s.n. [Herb. Philip. Bur. Sci. 17903] (W--1050776); M. Ramos s.n. [Herb. Philip. Bur. Sci. 8132] (W--629373), s.n. [Herb. Philip. Bur. Sci. 21755] (W--568590), s.n. [Herb. Philip. Bur. Sci. 27610] (W--1293798), s.n. [Merrill Sp. Blanc. 637] (W--904314); Ramos & Edaño s.n. [Herb. Philip. Bur. Sci. 29306] (W--1294732); H. N. Whitford 404 (W--851588); R. S. Williams 115 (W--706817). Masbate: E. D. Merrill 3375 (W--438356). Mindanao: Ahern 662 (W--445407, W--445842); DeVore & Hoover 106 (W--449610); Elmer 10985 (W--779440), 13441 (W--1172253); Fénix s.n. [Herb. Philip. Bur. Sci. 26058] (W--1293799); C. M. Weber 1055 (W--712281). Mindoro: Mangubat s.n. [Herb. Philip. Bur. Sci. 937] (W--439745); R. C. McGregor 113 (W--854911); E. D. Merrill 1214 (W--436184); J. V. Santos 5239 (W--2246533). Samar: M. Ramos s.n. [Herb. Philip. Bur. Sci. 17427] (W--424949).

CALLICARPA FORMOSANA f. ALBIFLORA Yamamoto

Additional bibliography: Moldenke, Phytologia 14: 225 & 227--228. 1967.

CALLICARPA FORMOSANA f. ANGUSTATA Moldenke

Additional synonymy: Callicarpa formosanum f. angustata Moldenke apud E. H. Walker, Bibliog. East. Asiat. Bot. Suppl. 1: 235, sphalm. 1960.

Additional bibliography: E. H. Walker, Bibliog. East. Asiat. Bot. Suppl. 1: 235. 1960; Moldenke, Phytologia 14: 222, 225, 228--229, & 231 (1967) and 15: 24. 1967.

The corollas are described as "pink" on D. R. Mendoza 1433 and the plant has been found growing in rocky creeks, at 1060 meters altitude, flowering in May, and with green fruits in the same month. The plant has the appearance of a natural hybrid between C. formosana Rolfe and C. stenophylla Merr.

Additional citations: WESTERN PACIFIC ISLANDS: PHILIPPINE ISLANDS: Luzon: D. R. Mendoza 143 [Philip. Nat. Herb. 18495] (W--2214778); Ramos & Edaño s.n. [Herb. Philip. Bur. Sci. 29051] (W--1292845).

CALLICARPA FORMOSANA var. *CHINENSIS* P'ei

Additional bibliography: Moldenke, *Phytologia* 14: 225 & 229. 1967.

CALLICARPA FORMOSANA var. *GLABRESCENS* Moldenke

Additional bibliography: Moldenke, *Phytologia* 14: 225 & 229--230 (1967) and 15: 21. 1967.

This plant has been collected in anthesis in February.

Additional citations: WESTERN PACIFIC ISLANDS: PHILIPPINE ISLANDS: Luzon: Ramos & Edaño s.n. [Herb. Philip. Bur. Sci. 47223] (W--1527827).

CALLICARPA FORMOSANA var. *LONGIFOLIA* Suzuki

Additional bibliography: Moldenke, *Phytologia* 14: 228 & 230--231. 1967.

CALLICARPA FORMOSANA f. *PARVIFOLIA* Moldenke

Bibliography: Moldenke, *Phytologia* 14: 399 (1967) and 15: 24. 1967.

This form differs from the typical form of the species in having its mature leaf-blades (on fruiting specimens) uniformly only 1--3 cm. long and 7--15 mm. wide.

The type of the form was collected by L. Escritor at Palanan Bay, in the province of Isabela, Luzon, Philippine Islands, in June, 1913, and is deposited in the United States National Herbarium at Washington.

Citations: WESTERN PACIFIC ISLANDS: PHILIPPINE ISLANDS: Luzon: Escritor s.n. [Herb. Philip. Bur. Sci. 21155] (W--900843--type, Z--isotype).

CALLICARPA FULVA A. Rich.

Additional bibliography: A. S. Hitchc., *Ann. Rep. Mo. Bot. Gard.* 4: 118. 1893; Moldenke, *Phytologia* 14: 222, 231--234, 238, & 241. 1967.

CALLICARPA GRISEBACHII Urb.

Additional bibliography: Moldenke, *Phytologia* 14: 232 & 238--239. 1967.

CALLICARPA HAVILANDII (King & Gamble) H. J. Lam

Additional synonymy: *Callicarpa havilandii* King & Gamble, in herb.

Additional bibliography: Moldenke, *Phytologia* 14: 239--241. 1967.

Additional citations: INDONESIA: GREATER SUNDA ISLANDS: Sarawak: Native collector 525 (W--1173985).

CALLICARPA HITCHCOCKII Millsp.

Additional bibliography: Moldenke, *Phytologia* 14: 232 & 241. 1967.

CALLICARPA INTEGERRIMA Champ.

Additional bibliography: Moldenke, Phytologia 14: 220 & 243—246. 1967.

CALLICARPA JAPONICA Thunb.

Additional bibliography: Hayata, Journ. Coll. Sci. Univ. Tokyo 30 (1): 222. 1911; L. H. Bailey, Man. Cult. Pl., ed. 1, pr. 1, 633 & 804 (1924) and pr. 2, 633 & 804. 1925; Makino & Tanaka, Man. Fl. Nipp. fig. 187. 1927; Terasaki, Nippon Shokubutsu Zufu [Jap. Bot. Illustr. Album] fig. 1592. 1933; Tu, Chinese Bot. Dict., abrdgd. ed., 310. 1933; L. H. Bailey, Man. Cult. Pl., ed. 1, pr. 3, 633 & 804. 1938; Makino, Ill. Fl. Nippon fig. 560. 1940; L. H. Bailey, Man. Cult. Pl., ed. 1, pr. 4, 633 & 804 (1941), pr. 5, 633 & 804 (1944), and ed. 2, 844 & 1045. 1949; Liu, Illustr. Nat. & Introd. Lign. Pl. Taiwan 2: 1205, pl. 1013. 1962; E. E. Lord, Shrubs & Trees Austral. Gard., rev. ed., 250. 1964; Hellyer, Shrubs in Colour 20. 1966; Moldenke, Phytologia 14: 220—223, 225, & 249—256 (1967) and 15: 18. 1967.

Additional illustrations: Makino & Tanaka, Man. Fl. Nipp. fig. 187. 1927; Terasaki, Nippon Shokubutsu Zufu [Jap. Bot. Illustr. Album] fig. 1592. 1933; Makino, Ill. Fl. Nippon fig. 560. 1940; Liu, Illustr. Nat. & Introd. Lign. Pl. Taiwan 2: 1205, pl. 1013. 1962.

Siebold & Zuccarini (1846) say "524. C. Japonica Thunb. Fl. jap. p. 60 et Auct. (excl. Synon. C. longifoliae Lam.) Folia petiolata petiolo 4—9" longo, lamina utrinque longe attenuata acuminata, basi et apice integerrima utrinque serrata ceterum lanceolata, ovata vel ovato-rhombea, glabra, subtus glandulis monutis globosis, citrinis dense adspersa, 3—5" longa, 1—2" lata. Cymae axillares dichotomo-ramosissimae multiflorae, petiolum duplo superantes. Calyx urceolatus truncatus obsolete quadridentatus, uti pedunculi pilis stellatis adspersus. Corolla extus papilloso-pubescent, quadrifida. Stamina exserta; antherae obovato-oblongae, basi emarginatae, vertice truncatae, loculis apice poro obliquo dehiscentibus connectivo glandulis seriatis citrinis obsito.....527. C. Murasaki Sieb. Annuaire de la Soc. hortic. l. c. p. 25. C. mimurasaki Hasskarl hort. Bogor. p. 136. Ausser dieser und C. japonica erwähnt Hasskarl a. a. O. noch der C. acuminata H.B.K. und C. cuspidata Roxb. als aus Japan nach Java eingeführt. Mich allein die japanischen, sondern alle Arten von Callicarpa deren wir über 20 untersuchten, haben das Connectiv der Antheren dicht mit goldgelben Drüsen besetzt. Aehnliche Drüsen stehen auch immer auf der Rückseite der Blätter und werden nur häufig durch den filzigen Ueberzug (von Sternhaaren) verdeckt."

Hasskarl (1844) reports the Japanese vernacular name "mimurazaki" for this plant as cultivated at Buitenzorg, Java. Miquel (1865) -- whose reference is misdated "1866" by Nakai (1923) -- goes to considerable length in discussing the relationship between C. japonica Thunb. and C. longifolia Lam.: "Speci-

minum numerosorum examine manifesto constat hanc cum C. longifoliae formis glabratis coniungi non posse. Multis numeris C. americanae affinior est, nec longe a stirpe iaponica distare videtur C. rhynchophylla Miq. Fl. Ind. bat. II. p. 888. - Nostra iaponica a C. longifolia discernitur glabritie in adultis fere perfecta, glandulis citrinis illis in foliorum pagina inferiore et haud raro in inflorescentia calyce corollaque obviis maioribus magis scutellaeformibus et squamis orbiculato-concaviusculis teneris membranosis quam glandulae multoties maioribus iis licet perraro in foliis subtus intermixtis, foliis multo brevius saepe brevissime petiolatis, semper fere latis, haud raro rhombeo-lato-ovalibus, basi cuneata et acumine perspicue integerrimis, caeterum vulgo grossius serratis, firmioribus, floribus maioribus, Thunbergio teste albis (nec rubellis), corolla extus adeo papillosa ut tomento tenui obducta videatur (nec vario grado pilosula), baccis maioribus rubris (nec albis). - Innovationes pube stellata minuta densa vulgo grisea gilvulaque obductae citius glabrescentes, ita ut folia adulta fere glabra vel prorsus glabra sint; in pagina superiore praeter minutissimas et raras glandulas citrinas et aliquot pilos stellatos sub lente in iunioribus pilos exiles simplices iuvenies quos in C. longifolia nunquam vidi. Folia adulta chartacea, subtus perspicue pallidiora, 6 circiter utrinque costulis tenuiter distanterque transverse venosis pertensa, petiolis brevibus (1--4 vulgo 2 circiter, rarissime 6 lin. longis) suffulta, forma diversa in diversis speciminibus, ita v. c.; mox lato-elliptica vel e basi acuta elliptica acuminata praeter basin et acumen modice crenato-dentata 4-fere 6 poll. longa 1 3/3 -- 2 1/2 lata, mox vero latiora basique minus acuta, grossius et obtusius dentata brevius acuminata rugosiora sunt, costulis utrinque ad 9 (supremis tamen valde tenuibus) pertensa, passim marginibus sub-sinuata; mox folia abbreviata rhombeo-dilatata praesertim superne grossius dentata vel subserrata, 3 -- 1 1/2 poll. longa, a medio deorsum cuneata, acumine abrupto orto, perraro elongatiora et angustiora iis C. longifoliae quodammodo similiora inveniuntur. - Prostat etiam parvifolia, sequenti quodammodo similis, sed inflorescentia toto discernenda. - Pedunculi nunc exacte axillares, nunc vero paullo supra-axillares, quo casu vulgo gemma foliigena concomitans, tenues semipollicares vel breviores, iteratim dichotomi, cymam nunc contractiorem nunc vero laxiorem sistentes, sed vulgo tamen contractam e longinquo umbelliformem, cum floribus extus glandulis citrinis lucidis adpersam; in fructu cymae passim laxae 4--5es dichotomae, 1 1/2 poll. altae et latae, bracteis subulatis minutis persistentibus. Calyx semigloboso-obconicus 4-costulatus, e margine truncato obsolete 4-denticulatus, 1 1/2 lin. longus. Corolla 'alba' campanulato-infundibuliformis, lobis ovatis obtusis tubo fere duplo brevioribus, 1 1/3 lin. circiter longa. Filamenta alte exserta, antheris ellipticis, loculis basi acuta discretis, connectivo dorso lato dense glanduloso. Stylus apice sensim capitellato-incrasatus. Baccae calyce cupuliformi indiviso vel lobato suffultes,

laeves, subsiccae. - Variis locis v. c. prope Nangasaki, Iun. et Iul. fl.; SIEBOLD, BUEGER; in regionibus montanis sylvaticis prope pagum Susokatogi ins. Nippon, in declivibus montium Sata Foge, prope oppidum Kifura Sawa eiusdem insulae, ad radicem montis Takawo Foge insulae Kiusiu: PIEROT; prope Nangasaki: TEXTOR. - Jama Mura Saki vel Mura Saki vel Mi Mura Saki iap. - Porro in ZOLLING. pl. iap. Goering. sub n. 349."

Hottes (1942) says "Callicarpa japonica.....has larger berries and leaves [than C. dichotoma] (2 1/2 to 5 inches long). The leaves are toothed even at the base. There are fewer berries than in the previous mentioned sort [C. dichotoma]...The Beauty-berries produce attractive leaves and the shrubs are quite graceful though upright. In planting them, give a rather protected place. Although the fruits are tiny, they are attractive upon the plant for garden effect. When the fruit is cut and placed in vases, it displays its true charm. Soil. Circumneutral pH 6.0—8.0. Pruning. Prune back the plants severely each Spring as the flowers and fruits are borne on new wood. Objections. The winterkilling of much of the top growth necessitates annual pruning. The berries are covered by the leaves so that they are not as showy as they should be. Propagation. 1. Cuttings of half-ripe wood are generally used. Give a little bottom heat and humid conditions. Some cover cuttings with a belljar. Protect in frames for Winter or bring into greenhouse. 2. Layers. 3. Seed sown indoors in Fall. 4. Hardwood cuttings would only be successful when they do not freeze."

Van Melle (1943), in discussing C. japonica and C. dichotoma, says that these "are small shrubs, normally about 5 to 7 feet high, not perfectly -- i.e., not reliably -- hardy in our zone and likely to be killed back at least partly; a matter which does not interfere greatly with their usefulness since they flower and fruit on growth of the current season and may be treated as die-backs. In that case they will grow little more than 3 to 4 feet high. Their one, but considerable, contribution to the border is the effect of their attractive, small, clustered, lilac berries strung along the branches, ripening in the Autumn and remaining effective for a long time. These are sufficient reason to endure their rather uninteresting foliage and insignificant small flowers. Of the two, C. japonica is the more erect-growing, with darker, long-tapering leaves to 6 inches long....Both are unpretentious as to soil and succeed in sun or shade. They are worth planting in a small way for the sake of their pretty berries, which are among the most decorative of autumn effects."

Bean (1951) differentiates the commonly cultivated beautyberries in England as follows:

1. Leaves glabrous beneath (or nearly so), glandular.
2. Leaves 3--5 inches long, toothed in the central part.....C. japonica
- 2a. Leaves 1 1/2 -- 3 1/2 inches long, coarsely toothed in the apical part.....C. dichotoma

1a. Leaves downy beneath.

3. Leaves only slightly downy beneath, 2--5 inches long.....
xC. shirasawana

3a. Leaves distinctly downy beneath.

4. Leaves densely downy beneath.

5. Leaves 4--6 inches long.....C. rubella

- 5a. Leaves 2--4 1/2 inches long.....C. mollis

4a. Leaves moderately downy beneath.

6. Leaves 3--5 1/2 inches long; flower-clusters nearly
 sessile.....C. americana

- 6a. Leaves 2--5 inches long; flower-clusters stalked.....
C. bodinieri var. giraldii

In my own 1954 work on the cultivated species of the genus in California, the following key is offered:

1. Leaf-blades densely covered beneath with golden-yellow, closely appressed, circular or elliptic, concave scales.....
C. longifolia

1a. Leaf-blades without scales beneath.

2. Cymes very large and spreading, to 20 cm. long and 17 cm.
 wide, usually densely flowered; fruit white.....
C. macrophylla

- 2a. Cymes small, usually only about 1--5 cm. long and wide,
 densely or loosely flowered; fruit lilac or violet.

3. Leaves small and numerous, their blades usually about 2--
 6.5 cm. long and 1--2.3 cm. wide, toothed only above
 the middle, glabrous or subglabrate beneath.....
C. dichotoma

3a. Leaves larger, usually not crowded.

4. Leaf-blades usually stellate-tomentose beneath, usually
 very coarsely and more or less irregularly toothed a-
 long the margins with spreading teeth; peduncles as
 long as or shorter than the petioles, 3--10 mm. long;
 calyx-rim subtruncate, 4-apiculate, or very shortly
 triangulate-toothed.....C. americana

- 4a. Leaf-blades glabrous or sparingly pubescent beneath,
 more regularly serrate with more or less appressed
 antrorse teeth; peduncles longer than the petioles,
 5--25 mm. long; calyx-rim conspicuously 4-toothed or
 4-lobed with broad round teeth.

5. Leaf-blades oblong or oblong-elliptic, 6--12 cm. long,
 1.5--6.2 cm. wide.....C. japonica

- 5a. Leaf-blades ovate-elliptic or ovate, 10--18 cm. long,
 4.5--10 cm. wide.....C. japonica var. luxurians

L1 (1965) comments that C. japonica "is widely distributed in Korea and Japan, where it is a common deciduous shrub of the hills. It flowers in August and fruits in October through November". He also says concerning its occurrence on Formosa "Calli- carpa japonica, widely distributed in China and Japan, is not re- corded by Kanehira. P'ei.....considers C. dichotoma and C. japon- ica very difficult to separate from each other. Undoubtedly the

concept of C. dichotoma of most Japanese authors on the Taiwan flora includes also C. japonica. Masamune.....besides his C. japonica var. kotoensis (Hayata) Masamune.....considers C. japonica as present in Taiwan in the following forms: C. japonica var. luxurians Rehder, C. japonica f. kuruninsularis Masamune, and C. japonica var. angustata Rehder." His key for distinguishing C. japonica from the other commonly cultivated species of the genus is reproduced by me under C. bodinieri in the present series of notes (Phytologia 14: 53. 1966). Liu (1962) recommends the common name "Japanese beauty-berry" for this species. Lord (1964) tells us that it is a lime-loving plant and is cultivated in Australia.

Backer & Bakhuizen van den Brink (1965) describe the species as it occurs in Java as follows: "Exclusively cultivated. Drupe in Java always violet-red; cymes on 1/6 -- 2 cm long peduncles, 1--5 cm across; calyx minutely dentate or subtruncate, glabrous, 3/4 -- 1 1/4 mm high; corolla white or pink-lilac, 2--4 mm high; lobes glabrous; stamens 3--5 mm; style 3--5 mm. Young branches stellate-hairy; leaves elliptic-obovate-oblong, rarely subrhomboid, often rather abruptly long-acuminate, usually rather coarsely serrate-crenate, gland-dotted beneath, on both surfaces (excl. the upper surface of the larger leaves) soon becoming glabrous, 3--15 cm by 1 1/2 -- 7 cm; petioles 1/5 -- 1 1/2 cm. Shrub, 0.50--2.00; I--XII; native to Japan; in Java cultivated as an ornamental. Variable."

The Makino & Tanaka (1927) reference in the bibliography above is sometimes cited as "Fl. Jap. 1928", but is not so listed by Walker in his Bibliography of Eastern Asiatic Botany (1960). The "Nakai, Veg. Isl. Wangto" reference sometimes cited (e.g., Nakai, Fl. Sylv. Koreana 14: 30. 1923) appears to refer to Nakai, Saishu-to Narab. Kwan-to Shokub. Hokok. (Fl. Saishu & Kwan Isls.) (1914). According to my friend, Egbert H. Walker, "The name 'wangto' has been identified as the same as Quelpaert Island. To is Chinese for island and is often also used in Japan instead of shima or jima. Nakai wrote a report all in Japanese on the vegetation of Quelpaert Isl. off the coast of Korea. It is Nakai, 1914a on p. 343 in the Merrill & Walker Bibliography (1938)."

Material of C. japonica has been widely misidentified and distributed in herbaria under the names C. bodinieri var. giraldii (Hesse) Rehd., C. dichotoma (Lour.) K. Koch, C. dichotoma Raeusch., C. gracilis Sieb. & Zucc., C. japonica var. angustata Rehd., C. japonica var. luxurians Rehd., C. koreana Hort., C. mollis Sieb. & Zucc., and even Viburnum sp.

On the other hand, the Chiao 1046, Herb. Univ. Nanking 11345, and Yin 102, distributed as C. japonica, are actually C. bodinieri Léveillé; Y. Chen 736 [Herb. Univ. Nanking 15086], Cheo & Wilson 107 & s.n. [Herb. Univ. Nanking 12753], Chiao 1022 & s.n. [Herb. Univ. Nanking 14321 & 18896], Chung & Sun 204, A. Henry 5992, Hu

1621, Ling 2565 [Herb. Univ. Nanking 12515], McClintock s.n. [Nov. 16, 1959], E. D. Merrill 11298, and Sun 1176 & 1260 are C. bodinieri var. giraldii (Hesse) Rehd.; Chiao 2617, Coville s.n. [Garden of Whitman Cross, Chevy Chase, Oct. 29, 1926], Hiroe 12141, Hu 1634, In-Cho's collector 9904, and Liou 1660 are C. dichotoma (Lour.) K. Koch; Chiao 828 & 14128, Duss s.n., and Herb. Univ. Nanking 14128 are C. formosana Rolfe; Alling s.n. [Hondo, 1892], Chiao 1612, Chung & Sun 176 & 406, A. Henry s.n. [Prov. Hainan], Ip s.n. [Herb. Univ. Nanking 1402], Lau 4409, A. N. Stewart s.n. [Herb. Univ. Nanking 2426], and E. H. Wilson 8729, 9405, & 10548 are all C. japonica var. angustata Rehd.; Maximowicz s.n. [Hakodate, 1861] (in part) and Numata 36 are C. japonica var. luxurians Rehd.; Chiao 2617, Field & Low 21w, Mrs. R. K. Smith s.n. [8-10-1937] & s.n. [8-20-1938], E. H. Wilson 9262 & 10411, and Yongsok 9049 are C. japonica var. rhombifolia H. J. Lam; and A. Forbes 21 is C. pedunculata R. Br. Zimmermann 210 is in part C. japonica var. angustata and in part var. rhombifolia.

It is very probable that the A. N. Stewart s.n. [Herb. Univ. Nanking 2426], cited below, is actually var. angustata Rehd. Miquel (1870) cites from Japan 6 specimens collected by Bürger, one by Maximowicz, one by Mohnike, two by Oldham, 8 by Siebold, one by Textor, and one by Charles Wright. Forbes & Hemsley (1890) cite Carles s.n. [Soul mountains] from Korea, Oldham 622 from the "Corsan Archipelago", and C. Wright s.n. from the Kyukiu Archipelago, deposited in the herbaria at Kew and the British Museum. Matsumura (1899) cites J. Matsumura s.n. and Tashiro s.n. from Okinawa and Tanaka 308 from Yaeyama. P'ei (1932) cites only Zimmermann 210 from Shantung, China, En 2505 from Fukien, and Tai 11793 from Siangsai Island. The Univ. Calif. Bot. Gard. 38.533-S1 collection, cited below, was grown from seed sent from Kornik, Poland.

In all, 202 herbarium specimens and 6 mounted photographs have been examined by me.

Additional & emended citations: NORTH CAROLINA: Durham Co.: Harrar & Blomquist s.n. [rocky ground north of H.W. 751, 10/23/39] (H-55572). CHINA: Anhwei: Sun 1176 (N), 1260 (N). Chekiang: Chiao s.n. [Herb. Univ. Nanking 18896] (N, N, Ws); E. D. Merrill 11298 (N). Fukien: En 2505 (Ca--322208, N). Kiangsi: Chung & Sun 176 (N), 204 (N), 406 (N), 506 (N). Kwangtung: Tsui 601, in part (Ca--612427). Shansi: H. Smith 6166 (Go, S). Szechuan: C. L. Chow 4969 (W-1990594); W. K. Hu 8783 (W-1191002); Yin 102 (N). KOREA: T. H. Chung 5603 (M1); Faurie 734 (Du-14018); In-Cho 1096 (M1), 3331 (M1); In-Cho's collector 8486 (M1), 8537 (M1), 8540 (M1), 9517 (M1), 9541 (M1); Tae-Hyon 1094 (M1); K. Uno 23240 (Ba), 23240a (N); E. H. Wilson 10411 (W-1054233); Yongsok 6770 (M1),

6811 (Mi), 6896 (Mi), 7134 (Mi), 7135 (Mi), 7179 (Mi), 10048 (Mi).
 KOREAN COASTAL ISLANDS: Kangwha: In-Cho 3442 (Mi). Quelpart:
Faurie 1893 (V--126); Yongsok 8753 (Mi). Ullung: In-Cho 3246
 (Mi); Yongsok 2410 (Mi), 2446 (Mi). WESTERN PACIFIC ISLANDS: JA-
 PAN: Hiradosima: Weiss 1128 (Bz--17651). Hokkaido: Baker & Baker
s.n. [Muroran, July 31, 1914] (Gg--31982, Gg--31983); Kitamura s.
n. [31 Jul. 1953] (Ws); Maximowicz s.n. [Hakodate, 1861] (Bz--
 17648, C, T). Honshiu: Baker & Baker s.n. [Misaki, June 9, 1914]
 (Gg--31987), s.n. [Miyogi, 8-11-14] (Gg--31988); Collector unde-
termined 361 (W--9967), s.n. [Musashi, Nakano, 10 Juli 1910] (W--
 1133076); Dahlstrand s.n. [4/8/1954] (Go); Dorsett & Morse 787
 (N, W--1553407), 1448 (W--1553607); Furuse s.n. [3 July 1957] (S);
Herb. Mus. Bot. Stockh. s.n. [Musasi, 14/10/1910] (S); Herb. Sci.
Coll. Imp. Univ. s.n. [Uzen, July 20, 1887] (Vt); Herb. Umbach
20804 (Ws); Hiroe 7706 (Ca--82126), 13906 (Ws); Hurusawa 14-A (W--
 2073723); Y. Kimura 14-B (W--2037868); Kinashi s.n. [13-VI.1922]
 (Mi), s.n. (Mi); Kobayashi 14442 (S), 14472 (S), 16253 (S); Koyama
s.n. [July 22, 1956] (Mg); Kusaka s.n. [July 24, 1934] (Go);
Lindquist s.n. [30/9/1952] (Go); Lindquist & Nitzelius s.n. [3/9/
 1952] (Go), s.n. [5/9/1952] (Go); Y. Matsumura 1671 (N), 3788 (N),
6594 (N); Mizushima 208 (S); C. S. Sargent s.n. [Miyanoshita,
 August 25, 1892] (W--9969); Savatier 919 (Ph, W--9968, W--484077);
Sawada 2298 (S), s.n. [Hakone, Sakokura, 17.VII.1926] (S); C.
Skottsberg s.n. [Hondo, 27/10/1926] (Go); Suzuki UC.403 [Herb. Su-
 zuki 398036] (Ca--928687), UC.699 [Herb. Suzuki 433014] (Ca--
 930463); Tagawa 287 (Ws), 3283 (Ws); Tagawa & Iwatsuki 1726 (Ws,
 Ws); Tamaki s.n. [Senda, 10/7/1911] (Vi); Tanaka & Hiroe 8872
 (Ws); Tobe 15367 (S); Weiss 1488 (Bz--17649), 1814 (Bz--17653);
E. H. Wilson 7048 (W--778269), 7560 (W--778409); Yatoh s.n. [July
 4, 1955] (Vi). Kiushiu: Hurusawa 14-I (W--2073722); Masamune s.
n. [Satsuma, June 27, 1923] (N); Oldham 620 (S), 621 (M); T. Tan-
aka 121 [Herb. Tanaka 100161] (Ca--252183); Weiss 289 (Bz--17652),
701 (Bz--17650). Shikoku: Collector undetermined s.n. [Nanokawa,
 Tosa, June 21, 1892] (W--206172); Hurusawa 3696 (Vi); Tokui s.n.
[Iyo, Aug. 1953] (Vi). Yezo: Maries s.n. (Pa). Island undeter-
 mined: Baker & Baker 162 (Sd--19477); Blume s.n. (T); Burger s.n.
[Japonia] (Ca--918430); Faurie 3215 (K); Hogg s.n. (C); J. Matsu-
mura s.n. [June 1879] (W--147600); Oldham s.n. [Japan] (S); Sie-
bold s.n. (M, N). RYUKYU ISLAND ARCHIPELAGO: Okinawan Islands:
 Okinawa: Conover 1140 (W--1993179). Sakishima Islands: Ikema: F.
R. Fosberg 38546 (Z). Iriomote: Kanehira 3182 (N). Miyako: F.
R. Fosberg 38180 (Sm), 38315 (Sm). Ogami: F. R. Fosberg 38407
 (Sm). Island undetermined: Gressitt 532 (S). FORMOSA: Yamamoto,
Onuma, & Outi s.n. [Agincort, August 15, 1933] (W--2063387). PALAU

ISLANDS: Palao: Takamatsu 1273 (Bi, Bi), 1635 (Bi), 1792 (Bi).
 MICRONESIA: CAROLINE ISLANDS: Auluptagel: Takamatsu 1472 (Bi, Ca-805721). CULTIVATED: Austria: Herb. Bot. Inst. Univ. Wien s.n. [4.VI.1915] (Vu), s.n. [9.VIII.1923] (Vu). California: Eastwood s.n. [Landsdale, Oct. 1920] (Gg--31989); E. C. Marquand s.n. [July 10, 1935] (N); Univ. Calif. Bot. Gard. 38.533-S1 (Mi); Walther s.n. [Golden Gate Park, Nov. 1920] (Gg--31990); Wells, Lammererts, & McClintock s.n. [June 6, 1944] (N). Connecticut: Jansson s.n. [Oct. 9, 1937] (Go), s.n. [Oct. 12, 1957] (Go). Cuba: Acuffa & Roig 18967 (Es). England: Nicholson 2976 (Ed). Germany: Bormüller s.n. [Züschen] (B); Herb. Bot. Spath Berlin s.n. [27/10/34] (N); Hülphers s.n. [H. B. Berol. 1906] (S); Mildbraed s.n. [23 Juli 1947] (B); R. Schlechter s.n. [9.I.1925] (B). Japan: Takenchi 14-C (W--2037869). Java: Couperus 93 (Ol). Massachusetts: Blazic s.n. [Arnold Arb., June 1922] (Po--125339); R. B. Clark s.n. [Arnold Arb. 874-32] (Ms), s.n. [Arnold Arb. 12397b] (Ms), s.n. [Arnold Arb. 12938*a] (Ms); Herb. Arnold Arb. 1089-4 (Gg--31984); Kidder s.n. [31 Aug. 1925] (Oa--10747); Rehder s.n. [Herb. Arnold Arb. 1084-4] (Ur), s.n. [Arnold Arb., Aug. 22, 1898] (B, Ur), s.n. [Arnold Arb., Oct. 31, 1898] (Mi--photo), s.n. [Arnold Arb., Oct. 7, 1921] (Ur); R. E. Torrey s.n. [Amherst, June 21, 1947] (Ms); A. P. Wyman s.n. [Herb. Arnold Arb. 1089-1] (Io--34567, Io--34568), s.n. [Arnold Arb., Aug. 23, 1901] (Ur). Missouri: D. B. Dunn 14111 (Lb--51529). New York: Hartling s.n. [N. Y. Bot. Gard. Cult. Pl. 1036] (N), s.n. [N. Y. Bot. Gard. Cult. Pl. 03575] (N); H. N. Moldenke 5048 (N), 10821 (N); Teuscher 1063 (Mg), 1064 (Mg), 1065 (Mg), s.n. ["C. dichotoma"] (N), s.n. ["C. dichotoma var. koreana"] (N), s.n. ["C. shirasawana"] (N); R. S. Williams s.n. [N. Y. Bot. Gard. Cult. Pl. 1036] (N).

CALLICARPA JAPONICA f. *ALBIBACCA* Hara, Enum. Sperm. Jap. 1: 183. 1948.

Synonymy: *Callicarpa japonica* var. β *C. leucocarpa* Sieb., Jaarb. Konink. Nederl. Maatsch. Tuinb. [Ann. Hort. Pays-Bas] 1845: 71, pl. 5. 1845. *Callicarpa japonica* var. *leucocarpa* Sieb. ex Rehd. in L. H. Bailey, Stand. Cycl. Hort. 2: 628. 1914. *Callicarpa japonica* var. *leucocarpa* Nakai, Trees & Shrubs Indig. Jap., ed. 1, 336. 1922. *Callicarpa japonica* f. *leucocarpa* (Sieb.) Rehd., Bibl. Cult. Trees 584. 1949. *Callicarpa japonica leucocarpa* Bean in Chittenden, Roy. Hort. Soc. Dict. Gard. 1: 359. 1951. *Callicarpa japonica leucocarpa* Aul, N. Y. Herald Trib. Spec. Gard. Sect. 7, April 5. 1964; Moldenke, Résumé Suppl. 10: 5, in syn. 1964.

Bibliography: Sieb., Jaarb. Konink. Nederl. Maatsch. Tuinb. [Ann. Hort. Pays-Bas] 1845: 71, pl. 5. 1845; Rehd. in L. H. Bailey,

Stand. Cycl. Hort. 2: 628. 1914; L. H. Bailey, Man. Cult. Pl., ed. 1, pr. 1, 633 (1924) and pr. 2, 633. 1925; Rehd., Man. Cult. Trees, ed. 1, 776. 1927; Nakai, Trees & Shrubs Indig. Jap., ed. 2, 453. 1927; L. H. & E. Z. Bailey, Hortus 111. 1930; Moldenke in Fedde, Repert. Spec. Nov. 39: 304 (1936) and 40: 120. 1936; L. H. Bailey, Man. Cult. Pl., ed. 1, pr. 3, 633. 1938; Moldenke, Geogr. Distrib. Avicenn. 36. 1939; Rehd., Man. Cult. Trees, ed. 2, pr. 1, 804 & 932. 1940; Moldenke, Prelim. Alph. List Invalid Names 11. 1940; L. H. Bailey, Man. Cult. Pl., ed. 1, pr. 4, 633. 1941; Moldenke, Known Geogr. Distrib. Verbenac., ed. 1, 58, 71, & 87. 1942; Moldenke, Alph. List Invalid Names 9. 1942; L. H. Bailey, Man. Cult. Pl., ed. 1, pr. 5, 633. 1944; Rehd., Man. Cult. Trees, ed. 2, pr. 2, 804 & 932. 1947; Hara, Enum. Sper. Jap. 1: 183. 1948; Rehd., Bibl. Cult. Trees 584. 1949; Moldenke, Known Geogr. Distrib. Verbenac., ed. 2, 133, 157, & 177. 1949; L. H. Bailey, Man. Cult. Pl., ed. 2, 844 & 1045. 1949; Moldenke, Phytologia 3: 295 & 296. 1950; W. J. Bean in Chittenden, Roy. Hort. Soc. Dict. Gard. 1: 359. 1951; Moldenke, Résumé 172, 213, 244, & 444. 1959; Rehd., Man. Cult. Trees, ed. 2, pr. 9, 804 & 932. 1960; Li, Morris Arb. Bull. 14: 6. 1963; Aul, N. Y. Herald Trib. Spec. Gard. Sect. 7, April 5. 1964; Moldenke, Résumé Suppl. 10: 5. 1964; G. Grimm, N. Y. Herald Trib. Sect. 2, 20, February 6. 1966; Moldenke, Phytologia 14: 254. 1967; Wayside Gardens [Cat.] 1967: 140. 1967.

Illustrations: Sieb., Jaarb. Konink. Nederl. Maatsch. Tuinb. [Ann. Hort. Pays-Bas] 1845: pl. 5 [in color]. 1845; Aul, N. Y. Herald Trib. Spec. Gard. Sect. 7, April 5. 1964; G. Grimm, N. Y. Herald Trib. Sect. 2, 20, February 6. 1966; Wayside Gardens [Cat.] 1967: 140 [in color]. 1967.

This form differs from the typical form of the species in having white flowers and white fruit.

The form was introduced into cultivation in 1845. It is known as "white jewel berry" or "white jewel-berry". In previous publications I adopted the designation var. *leucocarpa* Sieb. for it. However, if the taxon is to be given form rank, then Hara's name is the valid one for it under the present International Rules.

It is offered to the horticultural trade by the Gulf Stream Nursery, Wachapreague, Virginia, and Wayside Gardens, Mentor, Ohio. Only Grimm (1966) and Wayside Gardens (1967) report the flowers as well as the fruit as white, but this seems very probable since it holds true for some other white-fruited forms in this genus. Siebold (1845) maintains that it differs from the typical form also in its fuscous branchlets and merely acuminate (not caudate) leaf-blades. Considering the great variability of the species in regard to the size and shape of the leaf-blades, it is very probable (as indicated by Rehder and other recent authors) that the fruit color is the only reliable way to identify it. As yet I have seen no material of this form.

Wayside Gardens (1967) describe this plant as follows: "A delightful, erect, bushy-growing shrub about 4 to 5 feet high.... covered in late July with thousands of close-set, small white flowers. These are followed in late September by masses of small

white berries. Very showy.....ideal to use with the purple form for fall arrangements", selling at \$3.25 each, three for \$9.25, and \$33.50 per dozen.

CALLICARPA JAPONICA f. *ALBIFLORA* Moldenke, *Phytologia* 13: 242. 1966.

Bibliography: Moldenke, *Phytologia* 13: 242. 1966; Moldenke, *Résumé Suppl.* 14: 4. 1966.

This form differs from the typical form of the species only in having white corollas.

The type of the form was collected by Ernest Henry Wilson (no. 10444) at Kongo-san, in the province of Kogen, Korea, at 330 meters altitude, on July 5, 1918, and is deposited in the United States National Herbarium at Washington. The collector notes that he saw only one bush of this form. Walker and his associates describe it as a shrub. It should be noted here that the corollas are said to be white also on *C. japonica* f. *albibacca* Hara, but in that form the fruits are also white, while in the present one they are the normal purple. Material has been misidentified and distributed in herbaria as *C. dichotoma* (Lour.) K. Koch.

Three specimens, including the type, have been examined by me.

Citations: CHINA: Kwangsi: R. C. Ching 6130 (N). KOREA: E. H. Wilson 10444 (W--1052230--type). WESTERN PACIFIC ISLANDS: RYUKYU ISLAND ARCHIPELAGO: Okinawan Islands: Okinawa: Sonohara s.n. [Walker, Sonohara, Tawada, & Amano 6354] (N).

CALLICARPA JAPONICA f. *ALBIFRUCTA* Hara, *Enum. Sperm. Jap.* 1: 184 [as "*albifructus*"]. 1948; Moldenke, *Phytologia* 3: 295. 1950.

Synonymy: *Callicarpa japonica* var. *luxurians* f. *leucocarpa* Nakai, *Trees & Shrubs Indig. Jap.*, ed. 2, 455. 1927.

Bibliography: Nakai, *Trees & Shrubs Indig. Jap.*, ed. 2, 455. 1927; Hara, *Enum. Sperm. Jap.* 1: 184. 1948; Moldenke, *Phytologia* 3: 295 (1950) and 4: 451. 1953; Moldenke, *Résumé* 172, 181, 243, 244, & 444. 1959; Moldenke, *Résumé Suppl.* 3: 19. 1962; Moldenke, *Phytologia* 14: 254. 1967.

This form differs from the typical form of the species in having the large leaves of var. *luxurians* and also white fruit.

Suzuki describes this as a very rare shrub in forests, at 50 meters altitude, fruiting in January, and called "8-shiroshikibu". Only a single specimen has been seen and examined by me.

Citations: WESTERN PACIFIC ISLANDS: NANPO ISLANDS: Hachijo: Suzuki 25 [Herb. Suzuki 391073] (Ca--793438).

CALLICARPA JAPONICA var. *ANGUSTATA* Rehd. in C. S. Sarg., *Pl. Wils.* 3: 369. 1916.

Additional & emended synonymy: *Callicarpa japonica angustifolia* Kwa-wi [trans. Savatier], *Arbor.* 1: pl. 15. 1759; Stapf, *Icon. Bot. Ind. Lond.* 1: 526. 1929. *Callicarpa japonica* f. *angustifolia* Miq., *Cat. Mus. Bot. Lugd.-Bat.* 70, nom. nud. 1870. *Callicarpa*

longifolia Hemsl. apud Rehd. in C. S. Sarg., Fl. Wils. 3: 369, in syn. (in part). 1916 [not C. longifolia Auct., 1965, nor Benth., 1966, nor Blume, 1936, nor Diels, 1916, nor Mance, 1932, nor Hook., 1932, nor L., 1820, nor Lam., 1783, nor Roxb., 1827, nor Vahl, 1936, nor "sensu Li", 1966, nor "sensu Mori", 1963]. Callicarpa caudatifolia Koidz., Bot. Mag. Tokyo 39: 8. 1925. Callicarpa longifolia sensu Hemsl. apud Rehd., Bibl. Cult. Trees 584, in syn. (in part). 1949. Callicarpa japonica angustata Mattoon, Pl. Buyers Guide, ed. 6, 83. 1958; Moldenke, Résumé Suppl. 7: 7, in syn. 1963. Callicarpa japonica f. angustata (Rehd.) Ohwi ex Moldenke, Résumé Suppl. 5: 6, in syn. 1962. Callicarpa japonica f. angustata (Rehd.) Mizushima, in herb.

Bibliography: Kwa-wi [trans. Savatier], Arbor. 1: pl. 15. 1759; Lam., Encycl. Méth. Bot. 1: 563. 1783; Lam., Tabl. Encycl. Méth. [Illustr. Gen.] 1: 293, pl. 69, fig. 2. 1791; Miq., Cat. Mus. Bot. Lugd.-Bat. 70. 1870; Forbes & Hemsl., Journ. Linn. Soc. Lond. Bot. 26 [Ind. Fl. Sin. 2]: 253. 1890; Diels in Engl., Bot. Jahrb. 29: 548. 1900; Rehd. in C. S. Sarg., Fl. Wils. 3: 366 & 369. 1916; Chung, Mem. Sci. Soc. China 1 (1): 226. 1924; Koidz., Bot. Mag. Tokyo 39: 8. 1925; Nakai, Trees & Shrubs Indig. Jap., ed. 2, 455--456, fig. [216]. 1927; Rehd., Man. Cult. Trees, ed. 1, 776. 1927; A. W. Hill, Ind. Kew. Suppl. 7: 36. 1929; Stapf, Icon. Bot. Ind. Lond. 1: 526. 1929; P'ei, Mem. Sci. Soc. China 1 (3): [Verbenac. China] 17, 31, 52, & 55--56, pl. 7. 1932; Moldenke in Fedde, Repert. Spec. Nov. 39: 304 (1936) and 40: 98, 120, 124, 125, 128, & 131. 1936; Moldenke, Geogr. Distrib. Avicenn. 36. 1939; Moldenke, Prelim. Alph. List Invalid Names 11. 1940; Worsdell, Ind. Lond. Suppl. 1: 160. 1941; Moldenke, Known Geogr. Distrib. Verbenac., ed. 1, 56, 58, 71, 86, & 87. 1942; Moldenke, Alph. List Cit. 1: 7, 13, 101, 102, & 275. 1946; Moldenke, Bol. Soc. Venez. Cienc. Nat. 11: 49. 1947; Hara, Enum. Sperm. Jap. 1: 184. 1948; Moldenke, Alph. List Cit. 2: 514, 563, & 594 (1948), 3: 697, 847, 895, 918, & 947 (1949), and 4: 1136. 1949; L. H. Bailey, Man. Cult. Pl., ed. 2, 844 & 1045. 1949; Rehd., Bibl. Cult. Trees 584. 1949; Moldenke, Known Geogr. Distrib. Verbenac., ed. 2, 130, 133, 157, & 177. 1949; W. J. Bean in Chittenden, Roy. Hort. Soc. Dict. Gard. 1: 359. 1951; Moldenke, Phytologia 4: 75. 1952; Mattoon, Pl. Buyers Guide, ed. 6, 83. 1958; Moldenke, Résumé 168, 172, 173, 213, 242, 244, & 444. 1959; Krüssmann, Handb. Laubgeh. 1: 255. 1959; Rehd., Man. Cult. Trees, ed. 2, pr. 9, 804 & 932. 1960; Moldenke, Résumé Suppl. 3: 18 & 30 (1962), 5: 6 (1962), and 7: 7. 1963; Li, Woody Pl. Taiwan 822--823 & 944. 1963; Li, Morris Arb. Bull. 14: 6. 1963; Moldenke, Résumé Suppl. 14: 3, 4, & 7. 1966; Moldenke, Phytologia 14: 54, 58, 59, 62, 99, 102, 142, 163, 164, & 167 (1966), 14: 228--230 & 254 (1967), and 15: 18, 19, 21, 31, & 32. 1967.

Illustrations: Kwa-wi [trans. Savatier], Arbor. 1: pl. 15. 1759; Nakai, Trees & Shrubs Indig. Jap., ed. 2, 456, fig. [216]. 1927; P'ei, Mem. Sci. Soc. China 1 (3): [Verbenac. China] pl. 7. 1932.

This variety differs from the typical form of the species in having narrower leaf-blades, which are oblong-lanceolate or oblanceolate, rarely elliptic-lanceolate, 5--12 cm. long, and only 1.2--3.5 cm. wide.

The type of the variety was collected by Ernest Henry Wilson (no. 2195) in thickets at 1500 meters altitude, Hsing-shan Hsien, Hupeh, China, in July, 1907, and is deposited in the Arnold Arboretum Herbarium at Cambridge, Massachusetts. Rehder (1916) says: "This variety seems to differ from the type only in its narrower leaves and might be considered a mere form of C. japonica if it did not occupy a different geographical area. From narrow-leaved glabrescent forms of C. Giraldiana it is easily distinguished by the oblong anthers opening by a pore at the apex, and by the smaller long-stalked inflorescence. It has little relation to the true C. longifolia Lamarck.....which is a southern species and has according to Lamarck's description and figure narrow-lanceolate glabrous leaves about 25 cm. long and a longer-stalked larger inflorescence." In his 1927 work Rehder maintains that the variety is limited to central China and that it was introduced into cultivation in 1907. Actually, this taxon seems to be found naturally in central, eastern, and southern China, as well as in Korea, Japan, Hongkong, and Hainan Island.

Callicarpa japonica f. angustifolia was based by Miquel on three unnumbered specimens collected in Japan by Bürger.

Recent collectors describe the plant as a bush or shrub, woody, erect, much-branched, 1--4.5 m. tall, slender, the leaves light-green above, pale beneath, the calyx pale-green, the stamens bluish-pink, the anthers yellow, and the fruit green when immature, finally rosy-purple or black. The corollas are described as "purple" on R. C. Ching 5666, Chung & Sun 406, and E. H. Wilson 1342, "purplish" on R. C. Ching 2977, "rose-purple" on E. H. Wilson 1531, "pink" on E. H. Wilson 2195, "pale-pink" on MacDaniels s.n., and "whitish-pink" on How 71071.

The plant has been found growing in woods, thickets, ravines, valleys, and in shade on hillsides, on rock cliffs and rocky slopes in forests, and along roadsides or streamsides, at 100 to 1500 meters altitude, flowering from June to October, and fruiting from July to October. Wilson refers to it as "common" in thickets, woods, and open country, Tsang says "fairly common in dry sandy soil of thickets", while Ching calls it a "common shrub in open valleys". Chun & Sun refer to it as an "herb", while Tsang calls it a "woody climber, 3 feet tall". Fang erroneously refers to the fruit as "a small nut".

The C. longifolia ascribed to Hemsley and referred to in the synonymy above is in part C. japonica var. angustata and in part C. bodinieri var. giraldii (Hesse) Rehd. The various C. longifolia homonyms ascribed to "Auct.", to Blume, to Linnaeus, to Roxburgh, and to Vahl are all synonyms of C. longifolia Lam., that ascribed to Benthham, to Hance, and "sensu Mori" is C. longissima

(Benth.) Hance, that attributed to Diels is C. bodinieri var. giraldii (Hesse) Rehd., that attributed to Hooker is C. brevipes (Benth.) Hance, and the "sensu Li" homonym belongs in the synonymy of C. japonica var. luxurians Rehd.

Bean (1951) gives the name, C. longifolia, without any further circumscription, as a synonym of C. japonica var. angustata. Li (1963) includes as synonyms "C. parviflora Hayata" and C. randaiensis Hayata, saying "The reduction of C. randaiensis Hayata is made on the basis of the type and the original description. Callicarpa parviflora Hayata has been previously reduced to the synonymy of C. randaiensis by Kanehira." The "C. formosana f. angustata (Rehd.) Moldenke" which he also places in this synonymy is so placed in error. My trinomial, C. formosana f. angustata Moldenke, applies to an entirely different taxon, is based on an entirely different type, and has nothing whatever to do with Rehder's trinomial!

Li (1963) also states that this variety occupies "a distinct geographical area, in central to northwestern and western China" [which, as we have seen above, is not accurate]. "It is a small shrub to about 1.5 m. tall with pink flowers and rosy purple fruits. It was found growing in thickets at 1000—1500 meters in western China by E. H. Wilson in 1900 and again in 1907 (Rehder, 1917). It resembles somewhat C. Bodinieri var. Giraldii of the same general area especially in the more narrow-leaved glabrescent forms of the latter, but it is differentiated by the more oblong anthers opening by a pore at the apex as well as by the smaller but longer-stalked inflorescence." Rehder (1916), by the way, dates Lamarck's original description of C. longifolia (1783) as "1785". P'ei (1932) tells us that C. japonica var. angustata differs from C. dichotoma (Lour.) K. Koch in its "long willow-like leaves which are toothed throughout." Mattoon (1958) lists only one horticultural source.

The printed label accompanying E. H. Wilson 10548 is inscribed "Japan", but Dr. T. Koyama assures me that the locality given on the label is actually in Korea. The Chiao s.n. [Herb. Univ. Nanking 18896] collection seems to be a mixture -- the Britton Herbarium sheet is typical C. japonica Thunb., while the United States National Herbarium specimen is plainly var. angustata Rehd.

Material has been misidentified and distributed in herbaria under the names C. bodinieri var. giraldiana (Hesse) Rehd., C. dichotoma (Lour.) K. Koch, C. dichotoma Raeusch, C. giraldiana Hesse, C. giraldiana var. rosthornii (Diels) Rehd., C. giraldiana var. subcanescens Rehd., C. japonica Thunb., C. koreana Hort., C. longifolia var. brevipes Benth., C. oligantha Merr., and C. purpurea A. L. Juss.

On the other hand, the Dorsett & Morse 787, Furuse s.n. [3 July 1957], and Savatier 919, distributed as C. japonica var. an-

gustata, are typical C. japonica Thunb.

Rehder (1916) cites also the following: CHINA: Hupeh: A. Henry 6679; C. Silvestri 1954; E. H. Wilson 1342. Kiangsi: E. H. Wilson 1530, 1530a. Shensi: Giraldi s.n. [monte Kin-qua-san, July 10, 1897]. Probably all of these specimens are deposited in the herbarium of the Arnold Arboretum. P'ei (1932) cites: CHINA: Anhwei: R. C. Ching 2977; K. Ling 1189. Hupeh: Chun 4035; A. Henry 6127; C. Silvestri 1954; E. H. Wilson 1342, 1530 (in part), 2195. Kiangsi: Chun 4276; Ip s.n. [Lushan, Jan. 1922]; A. N. Steward s.n. [Lushan, July 1922]; E. H. Wilson 1530 (in part), 1530a. Kiangsu: Chun 4251. CHINESE COASTAL ISLANDS: Hainan: A. Henry s.n. He gives its further distribution as "Japan".

Li (1963) cites from FORMOSA: H. H. Bartlett 6053, Faurie 394 & s.n., Gressitt 315, Hayata & Mori 7023, Kanehira 2878, Kawakami & Mori 2878 & 2879, Matuda 197 & s.n., Suzuki 6986 & s.n., and E. H. Wilson 10848. However, Hayata & Mori 7023 is the type collection of C. randaiensis Hayata, which see, and Kawakami & Mori 2879 is the type collection of C. parvifolia Hayata, a synonym of C. randaiensis.

In all, 76 herbarium specimens, including type material of some of the names involved, and 4 mounted photographs have been examined by me.

Additional citations: CHINA: Anhwei: Cheng 3904 (W-1674256); R. C. Ching 2977 (Ca-347827, S, W-1430584); K. Ling 1189 [Herb. Univ. Nanking 7754] (Ca-259204). Chekiang: Barchet 557 (W-596119); Chiao s.n. [Herb. Univ. Nanking 18896], in part (W-1554165). Hupeh: A. Henry 6127 (N); E. H. Wilson 1342 (N, W-596749), 2193 (W-777380), 2195 (Gg-31986—isotype, N—photo of type, W-777381—isotype). Kiangsi: Chiao 1606 [Herb. Univ. Nanking 18595] (N, W-1554132), 1612 [Herb. Univ. Nanking 18601] (N, W-1554120, Ws), 18625 (N); Chung & Sun 176 (N), 406 (N); Ip s.n. [Herb. Univ. Nanking 1402] (Ca-230384); Lau 4409 (S, W-1753085); A. N. Steward s.n. [Herb. Univ. Nanking 2426] (Bi, Bz-17569, Ca-230390, Io-114024, Mv, W-1279528); E. H. Wilson 1530 (W-777230), 1531 (W-777231). Kiangsu: Cheng 578 (W-1626810). Kwangsi: R. C. Ching 5666 (Ca-409743, N, W-1248672). Kwangtung: Herb. Canton Chr. Coll. 12677 (W-1247930); C. O. Levine s.n. [Herb. Canton Chr. Coll. 1751] (W-877420), s.n. [Herb. Canton Chr. Coll. 3353] (W-1270927); E. D. Merrill 11112 (Ca-301088, Ca-992556, Gg-31978, N); W. T. Tsang 21346 (Ca-11274, I, N, N, S); Tsui 450 (N). Shantung: Chiao 2916 (N, N, W-1599069); Zimmermann 210, in part (S). Shensi: Purdom 909 (W-1092865); Szechuan: Fang 2529 (N); T. C. Lee 3735 (W-1990234); H. Smith 10025 (Go). CHINESE COASTAL ISLANDS: Hainan: A. Henry s.n. [Prov. Hainan] (W-456243); How 71071 (W-1675815). HONGKONG:

Weiss 1705 (Bz--17662). KOREA: E. H. Wilson 3729 (W--1054150), 9405 (W--1054190), 10548 (W--1054254). WESTERN PACIFIC ISLANDS: JAPAN: Amakusa: Hayakawa's collector A.4 (Ca--320694). Honshiu: Alling s.n. [Hondo, 1922] (N); Kobayashi 13608 (S). CULTIVATED: England: I. R. Jones 637-25 (Ba). Massachusetts: Rehder s.n. [E. H. Wilson 633] (Ur), s.n. [Arnold Arb., Aug. 8, 1919] (Ur); Sears s.n. [Arnold Arb. 6712-1-A] (Ba). New York: MacDaniels s.n. [West Hill, Ithaca, July 10, 1940] (Ba).

ADDITIONAL NOTES ON THE GENUS CASTELIA. II

Harold N. Moldenke

Additional & emended bibliography: A. L. Juss., Ann. Mus. Nat. Hist. Nat. Paris 7: 69--70. 1806; Hook., Bot. Misc. 1: 159 & 172. 1829; Bocq., Adansonia 3: [Rev. Verbenac.] 236. 1863; F. Phil., Cat. Pl. Vasc. Chil. 217 & 221. 1881; Jacks. in Hook. f. & Jacks., Ind. Kew. 2: 493 & 628 (1894) and 2: 1179. 1895; M. Kunz, Anatom. Untersuch. Verb. 55. 1911; Baeza, Nomb. Vulg. Pl. Silv., ed. 2, 63, 176, & 263. 1930; K. V. O. Dahlgren, Svensk. Bot. Tidsk. 32: 231. 1938; Ragonese, Revis. Invest. Agric. 5: 81, 83, & 205--206. 1951; Acevedo de Vargas, Bol. Mus. Nac. Hist. Nat. Chile 25: 40--41. 1951; Darlington & Wylie, Chromosome Atl., pr. 1, 324 & 504. 1955; Angely, Cat. Estat. Gen. Bot. Fan. 17: 3. 1956; Angely, Fl. Paran. 7: 4. 1957; Moldenke, Phytologia 6: 232--241. 1958; Troncoso, Darwiniana 11: 597. 1959; Muñoz Pizarro, Sin. Fl. Chil. 199. 1959; Moldenke, Biol. Abstr. 36: 2311. 1961; Darlington & Wylie, Chromosome Atl., pr. 2, 324 & 504. 1961; Moldenke, Phytologia 7: 368. 1961; Soukup, Biota 4: 141. 1962; Hocking, Excerpt. Bot. A.5: 42 (1962) and A.6: 533. 1963; Moldenke, Phytologia 12: 6. 1965.

The Hooker (1829) reference cited above is sometimes incorrectly dated "1830". Soukup (1962) reports that the tubers of Castelia are edible.

CASTELIA CUNEATO-OVATA Cav.

Recent collectors describe this plant as 20--40 cm. tall, bearing edible tubers and fleshy leaves, inhabiting wet clay slopes and weedy places by irrigation ditches, at 1--2300 meters altitude, fruiting in January and June. The corollas are described as "white" on T. Meyer 3883 and Pfister s.n., "violet" on Angulo & Ridoutt 233, "lilac" on Cárdenas 3712, "rose" on Venturi 7848, and "purple" on H. H. Bartlett 20480. The vernacular name "papilla", recorded by Philippi for this species, is applied also to Valeriana papilla DC. Material of C. cuneato-ovata has been misidentified and distributed in herbaria as Labiatae sp.

Troncoso (1959) makes the following interesting comment: "Es

interesante hacer notar que con Priva boliviana, el género Priva Adans. queda definitivamente incorporado al catálogo de la flora argentina, con una especie que le pertenece sin discusión. Había quedado eliminado del mismo al ser excluida del género su hasta hace poco único representante argentino, Priva cuneato-ovata (Cav.) Rusby (sin.: Priva laevis Juss.), planta común en el centro y oeste argentino. Se ha vuelto a considerarla como género aparte, Castelia Cav., reconociéndose hasta hace poco como Castelia cuneato-ovata Cav. Recientemente, J. Caro, en las Cuartas Jornadas Argentinas de Botánica en Córdoba, rechaza el género Castelia Cav. por nomen regicendum y considera la planta especie de Pitraea Turcz."

Personally, I see no valid reason for rejecting the generic name, Castelia, since it was validly published in 1801, while the Castelia of Liebmann was not published until 1853 and has since been replaced by Neocastela Small.

Additional citations: PERU: La Libertad: Angulo & Ridoutt 233 (S). BOLIVIA: Potosí: Cárdenas 3712 (W--1909479). CHILE: Antofagasta: Pfister s.n. [Calama, 2-I-1950] (Ac). Arica: Jaffuel 1612 (W--1659377). ARGENTINA: Córdoba: Fabris 1199 (W--2144793). Jujuy: Venturi 4865 (Du--372503), 8594 (Du--372505). La Rioja: Venturi 7848 (Du--372504). Mendoza: H. H. Bartlett 19370 (Mi, W--1904439). Salta: Hjerting, Petersen, & Rahn 338 (S); T. Meyer 3883 [Herb. Inst. Miguel Lillo 35686] (G); C. Skottsberg s.n. [Cafayate, 19/10/1949] (Go). Tucumán: Dinelli s.n. [Herb. Inst. Miguel Lillo 32459] (Du--317606); Schreiter s.n. [Herb. Inst. Miguel Lillo 32600] (W--1802554).

PARTIAL REVIEW OF DOTY & MUELLER-DOMBOIS' "ATLAS", AND NEW TAXA IN HAWAIIAN RUBIACEAE, II

Otto & Isa Degener

We fear Maxwell S. Doty and Dieter Mueller-Dombois' "Atlas of Bioecology. Studies in Hawaii Volcanoes National Park" is marred by certain plant determinations conveniently summarized in Chapter VI, D., under authorship of F. R. Fosberg. Being residents less than a mile from Park Headquarters where its herbarium is deposited, we have begun the study of the specimens available and here take the opportunity to correct part of Dr. Fosberg's annotated list, so far as our present opinions dictate. We are handicapped in many cases, unfortunately, by the absence in the herbarium of voucher specimens mentioned in the "Atlas". Some of these may be in the United States National Herbarium, New York Botanical

Garden and B. P. Bishop Museum; others are on loan to Dr. Fosberg, as mentioned by him on page 154 and by a note in his handwriting in the Park herbarium dated September but without the specified year. Wherever a number in the "Atlas" does not coincide due to an obvious typographical error with that of the sheet in the Park herbarium, we do not bother to correct the slip.

The list of plants that existed in the past and that exist here now within the Park boundary would be augmented if Park specimens collected in past years by numerous botanists and scattered in American and European institutions were more easily available for study. The senior reviewer, for instance, collected within the Park area frequently since 1922, most of his collections being deposited at the New York Botanical Garden and the University of Massachusetts. Future compilers of the Park flora should watch for such specimens, checking and when necessary updating their often archaic nomenclature.

The present review not only changes nomenclature to our liking, but adds new records of taxa based on our own recent field work in the area covered. Regarding the ferns and "fern allies", we are glad that Douglass H. Hubbard in "Ferns of Hawaii National Park" has produced a work that has aided the Park visitor since 1952 in identifying the species about him. We regret Dr. Fosberg did not follow the superior Hubbard compilation as a model.

OPHIOGLOSSACEAE

Atlas page 155. Ophioderma falcatum (Presl) Degener, according to our opinion, is our correction for his Ophioglossum pendulum var. falcatum (Presl) Fosberg.

GLEICHENIACEAE

Page 155. Dicranopteris emarginata W. J. Robinson is our correction for his Gleichenia linearis (Burm. f.) C. B. Cl. This is represented in the herbarium by Morley 122-H. Voucher specimen Eggler 265, like so many others listed by Fosberg, is missing. Perhaps it is the following species:

P. 155. Dicranopteris linearis var. maxima (Christ.) Deg. & Deg. Fosberg recognizes neither the genus Dicranopteris nor the species D. emarginata, in our opinion a double error. As Fagerlund & Mitchell in their "Checklist of Plants" (1944) and Hubbard in his "Ferns Haw. Nat. Park" (1952) list only the hairy species, and not the glabrous one, as occurring within the Park boundary as it existed in their times, Fosberg's record of the latter may be unfounded. He deposited no specimen in the Park herbarium to prove his point; nor have we come across authentic material in either herbaria or the wild.

HYMENOPHYLLACEAE

P. 156. Sphaerocionium lanceolatum (Hook. & Arn.) Copel., is the modern name for his Hymenophyllum lanceolatum Hook. & Arn.

P. 156. Sphaerocionium obtusum (Hook. & Arn.) Copel., is his Hymenophyllum obtusum Hook. & Arn.

P. 156. Mecodium recurvum (Gaud.) Copel., is his Hymenophyllum recurvum Gaud.

P. 156. Vandenboschia cyrtotheca (Hillebr.) Copel., is his Trichomanes cyrtotheca Hillebr. Fosberg's "Trichomanes davallioides Gaud.", more correctly known as Vandenboschia davallioides (Gaud.) Copel., is merely his misidentification of Morley 114-H for the same species. This Vandenboschia is not represented in the Park herbarium at all. It is listed, however, by synonym both by Fagerlund & Mitchell and by Hubbard.

P. 156. Gonocormus minutus (Bl.) v. d. Bosch is his Trichomanes saxifragoides Presl.

PTERIDACEAE

P. 156. Adiantum capillus-veneris L., we have not yet seen within the Park boundary, and a voucher specimen is much desired for inclusion in its herbarium to settle the question as to whether it really occurs here. We join with Fosberg in the belief that this record is based in error on the naturalized A. cuneatum Langsd. & Fisch.

P. 164. Cibotium chamissoi Kaulf., the prickly treefern, Fosberg lists in error as C. menziesii Hook.

P. 164. Cibotium glaucum Hook. & Arn., is ubiquitous in many areas but Fowler 239, listed by Fosberg as such, is a novelty awaiting formal description and naming by Dr. V. Krajina in his forthcoming monograph of the genus. The true C. glaucum, represented by the vouchers Fowler 241 and Stone 2948, Fosberg identified in error as C. splendens (Gaud.) Krajina, a species common on Oahu. His record of C. splendens, until authentic material should be collected, is very questionable indeed.

P. 164. Cibotium hawaiiense Nakai & Ogura, listed and figured by Hubbard, is missing from Fosberg's list without explanation.

P. 164. Cibotium splendens (Gaud.) Krajina, appearing in Fosberg's list, is based on errors of identification, as mentioned above. We would omit it as a component of the Park flora.

P. 159. Doryopteris decipiens (Hook.) J. Sm., alone and partially hybridized with the common D. decora Brack., Fosberg lists as Doryopteris decora var. decipiens (Hook.) Tryon.

P. 162. Pityrogramma calomelanos (L.) Link is the silverfern as Fosberg states correctly, but we do not agree with him that the goldfern is the same species. Here we prefer to follow Neal, "In Gardens of Hawaii" (1965), in calling it the following:

P. 162. Pityrogramma chrysophylla (Sw.) Link. Copeland under the genus in his "Genera Filicum" (1947) stated that "Once the most popular cultivated ferns, these are still very common in culture, and in bewildering variety. They hybridize freely in cultivation,

and presumably in nature, which makes their specific identification difficult or impossible." Though the silver- and goldferns hybridize in the Park, we do not consider this miscegenation sufficient grounds for Dr. Fosberg to lump two species into one.

P. 163. Pteris vittata L., an introduced fern of the Old World tropics, is listed in error by Fosberg as Pteris longifolia L., a fern of the New. The former, besides other characters, does not have articulate, deciduous pinnae so prominent in the latter.

POLYPODIACEAE

P. 163. Adenophorus sarmentosus (Brack.) K. A. Wilson is his Polypodium sarmentosum Brack.

P. 162. Amphoradenium hymenophylloides (Kaulf.) Copel., is his Polypodium hymenophylloides Kaulf.

P. 163. Amphoradenium tamariscinum (Kaulf.) Copel., is his Polypodium tamariscinum Kaulf.

P. 162. Grammitis hookeri (Brack.) Copel., is his Polypodium hookeri Brack.

P. 163. Grammitis tenella Kaulf., is his Polypodium pseudo-grammitis Gaud.

P. 162. Pleopeltis thunbergiana Kaulf., is his Polypodium thunbergianum (Kaulf.) C. Chr.

P. 162. Polypodium pellucidum var. vulcanicum Skottsb., is his Polypodium pellucidum Kaulf., almost without exception.

P. 162. Polypodium scolopendrium Burm. f., or perhaps better Phymatodes scolopendria (Burm. f.) Ching, is his Polypodium scolopendria Burm. f.

P. 163. Xiphopteris saffordii (Maxon) Copel., is his Polypodium saffordii Maxon.

ASPIDIACEAE

P. 160. Elaphoglossum hirtum var. micans (Mett.) C. Chr., is the local taxon of his Elaphoglossum hirtum (Sw.) C. Chr., which was apparently first described from Jamaica.

P. 160. Elaphoglossum wawrae (Luer) C. Chr., is his Elaphoglossum alatum Gaud., represented by Nos. Morley 32-H (evidently a misprint for 22-H), 139-H and F & M 685. What he would consider F & M 695 to be we do not know as the specimen is missing in the herbarium.

P. 159. Cyclosorus cyatheoides (Kaulf.) Farwell is his Dryopteris cyatheoides (Kaulf.) Kuntze.

P. 159. Cyclosorus dentatus (Forsk.) Ching is his Dryopteris dentata (Forsk.) C. Chr.

P. 160. Cyclosorus sandwicensis (Brack.) Copel., is his Dryopteris stenogrammoides [sic] (Baker) C. Chr.

- P. 159. Lastrea globulifera Brack., is his Dryopteris globulifera (Brack.)
- P. 160. Lastrea torresiana (Gaud.) Moore, an Asiatic plant, is mistaken for Dryopteris setigera (Bl.) Kuntze.
- P. 160. Dryopteris keraudreniana (Gaud.) C. Chr., is the correct spelling for his D. keraudraniana.

BLECHNACEAE

- P. 163. Sadleria pallida Hook. & Arn., is his Sadleria hillebrandii W. J. Rob. This fern, so conspicuous by its prominent, almost translucent veins, is most easily observed in the wetter jungle along the Byron Ledge Trail. Here it occasionally hybridizes with the almost ubiquitous S. cyatheoides Kaulf., characterized by obscure venation. Such hybridization, in all possible degrees, is rampant beyond the Park boundary about the village of Volcano, where bulldozing has not yet destroyed the magnificent, pristine jungle.

ASPLENIACEAE

- P. 157. Asplenium macraei f. strictum (Brack.) Skottsb., we prefer for his Asplenium macraei var. stricta [sic] (Brack.) Hieron.
- P. 157. Neottopteris nidus (L.) J. Sm., we prefer for his Asplenium nidus L.

LYCOPODIACEAE

- P. 164. Lycopodium cernuum var. crassifolium Spring is his Lycopodium cernuum L. We have seen no authentic material in the Islands of the species itself. Fosberg states that "Gametophytes have been found in steam cracks at Kilauea," yet fails to cite the senior reviewer's article in the bibliography on page 449 of the "Atlas" about it. This article appeared in Bot. Gaz. 80: 26-46. 1925.

SELAGINELLACEAE

- P. 165. Selaginella arbuscula (Kaulf.) Spring is correctly identified by Fosberg so far as vouchers "s. Coll. 369 and M-D H-102" are concerned. His "Morley 186-H," however, because of the character of the leaves, is the var. menziesii mentioned below.
- P. 165. Selaginella arbuscula var. menziesii (Hook. & Grev.) Skottsb., is the correct disposition of most of his material labeled Selaginella menziesii (Hook. & Grev.) Spring.

PSILOTACEAE

- P. 165. Psilotum complanatum forma fosbergii Deg. & Deg., is his Psilotum "complanatum" Sw. We mentioned in our Flora Hawaiiensis under Family 21 on April 30, 1959 that we considered two varieties of this genus existed. The taxon fosbergii, after more

extended study of Psilotum material in the Marie O. Neal Herbarium of the Bishop Museum, we finally judged on May 1, 1966 to be only a form rather than a variety.

P. 165. Psilotum nudum var. oahuense (Mueller) Deg. & Deg., is his Psilotum nudum (L.) Beauv.

Perhaps it is not out of place to mention here that the Hawaiian flora is a difficult one, and a challenge to many workers living in many regions. Thus for the ferns and flowering plants of our archipelago Chock of Honolulu, for example, concentrated on Sophora; Kern of Leiden on certain Cyperaceae; Krajina of Vancouver on Cibotium; the late Rock of Honolulu on Cyrtandra, and on Lobeliaceae later revised by the late Wimmer of Vienna; the late Sheriff of Chicago on many Araliaceae, many Caryophyllaceae, many Compositae, many Euphorbiaceae, Labordia, some Leguminosae, and Pittosporum; the late Skottsberg of Gothenburg on Astelia, Pipturus, Santalum, Scaevola, Vaccinium and Wikstroemia; Sleumer of Leiden on Styphelia; Stone of Kuala Lumpur on Pelea; the late Yunker of Greencastle on Peperomia; Wagner of Ann Arbor on Diellia; Fosberg of Falls Church on several genera of Rubiaceae; etc. The latter botanist deals with the Rubiaceae of the Park in great detail, listing trivial and even hybrid taxa as he understands them. We feel that the other workers mentioned above, specialists in their respective genera, are more or less similarly experts and hence feel that their opinions regarding plants are worthy of mention in equal detail to that of the Rubiaceae. This deficiency in the "Atlas" we shall try to rectify regarding all Park flowering plants in a subsequent Partial Review.

The science of taxonomy advances not by leaps and bounds but more often by step after faltering step. In the case of the genus Gouldia represented in the Park, we believe we brought Dr. Fosberg's monumental work (Bull. Bishop Mus. 147: 1-82. 1937) a step nearer the truth in the disposition of many lesser taxa (Phytologia 7: 465-467. 1961, repeated in error with a little change in 14: 213-214. 1967). It was not until the publication of Pacific Science 17: 421-423. 1963, by Dr. Robert L. Wilbur, a former resident of the Islands, that we realized Gouldia affinis (DC.) Wilbur takes precedence over G. terminalis (H. & A.) Hillebr. Fl. Haw. Isl. 168. 1888. As we have not noted any pertinent comments nor corrections by Dr. Fosberg in the literature though he has had several years time to do so, we take another faltering step in an attempt to improve our knowledge of Gouldia taxa. We follow the lead of Dr. Skottsberg who, in Arkiv för Botanik [Stockholm] 31A (4): 14. 1944, states that "Fosberg recognized only 3 species, one of these with a great number of varieties and forms. Some of these are, in my opinion, good species....." Many of these (G. antiqua (Fosb.) Skottsbg., G. cordata (Wawra) Fosb., G. gracilis (Fosb.) Skottsbg., G. kaala [sic] (Fosb.) Skottsbg., G. macrothyrsa

(Fosb.) Skottsbg., G. purpurea (Fosb.) Skottsbg.) Dr. Skottsberg raised to the more proper rank in Acta Horti Gotob. 15: 466, 517. 1944. We agree with Dr. Skottsberg, and here make some desired changes of our own.

1. Gouldia affinis var. gracilis (Fosb.) Deg. & Deg., was G. terminalis f. gracilis Fosb. in Bull. B. P. Bishop Mus. 147: 29. 1937. (Oahu).
2. G. affinis var. robusta (Fosb.) Deg. & Deg., was G. t. f. robusta Fosb. *ibid.* 147: 29. 1937. (Oahu).
3. G. angustifolia (Fosb.) Deg. & Deg., was G. t. var. beta Hillebr. Fl. Haw. Isl. 169. 1888 (in part) and G. t. var. angustifolia Fosb. *ibid.* 147: 43. 1937. (Molokai).
4. G. antiqua (Fosb.) Deg. & Deg., was G. t. var. antiqua Fosb. *ibid.* 147: 54. 1937. (Hawaii).
5. G. antiqua var. acuta (Fosb.) Deg. & Deg., was G. t. var. antiqua f. acuta Fosb. *ibid.* 147: 55. 1937. (Hawaii).
6. G. antiqua var. hirtellifolia (Fosb.) Deg. & Deg., was G. t. var. antiqua f. hirtellifolia Fosb. *ibid.* 147: 55. 1937. (Hawaii).
7. G. antiqua var. kauensis (Fosb.) Deg. & Deg., was G. t. var. antiqua f. kauensis Fosb. *ibid.* 147: 55. 1937. (Hawaii).
8. G. antiqua var. kekenaensis (Fosb.) Deg. & Deg., was G. t. var. antiqua f. kekena [sic] Fosb. *ibid.* 147: 54. 1937. We have altered the trivial orthography because of the mandate expressed by Article 73, Note 3 and recommendation 73D of the 1961 International Code of Botanical Nomenclature. (Hawaii).
9. G. antiqua var. oblonga (Fosb.) Deg. & Deg., was G. t. var. antiqua f. oblonga Fosb. in Brittonia 8 (3): 176. 1956. (Hawaii).
10. G. aspera (Fosb.) Deg. & Deg., was G. t. var. aspera Fosb. in Brittonia 8 (3): 175. 1956. (Hawaii).
11. G. axillaris f. glabriflora (sphalm for glabrifolia) (Fosb.) Deg. & Deg., in Phytologia 7: 466. 1961 and 14: 214. 1967, was G. hillebrandii var. typica f. glabriflora Fosb., in Bull. Bishop Mus. 147: 60. 1937. (Maui). We are not using the binomial G. hillebrandii as we are not convinced Wawra's type is an outright, recent hybrid. Skottsberg preceded us in this suspicion (Acta Horti Gotob. 15: 467. 1944) that "Fosberg's idea that the name axillaris cannot be used because Wawra's axillaris should be a hybrid is not supported by Wawra's collection, all of which I have examined." A breeding project, never attempted before, sponsored by IBP of alleged species, varieties, forms and hybrids in Gouldia would be very revealing.
12. G. bobeoides (Fosb.) Deg. & Deg., was G. t. var. bobeoides Fosb. in Bull. Bishop Mus. 147: 37. 1937. (Hawaii).

13. G. cirrhopetiolata Lévl. (Fedde Repert. Spec. Nov. Veg. 10: 150. 1911) is based on Faurie 344 from "Molokai: Pukoo" and on Faurie 416 from "Maui: Yao valley." If one of these specimens, like G. axillaris, were not a hybrid after all and were properly chosen as lectotype, some one must take a further step in correcting the nomenclature of Gouldia taxa. G. cirrhopetiolata hardly comes under Article 69 of the Code whereby a "name must be rejected if it is used in different senses and so has become a long-persistent source of error." We suspect Dr. Fosberg erred in considering it one of his "rejected and doubtful names" (Bull. Bishop Mus. 147: 64. 1937).
14. G. congesta (Fosb.) Deg. & Deg., was G. t. var. congesta Fosb. ibid. 147: 55. 1937. (Hawaii).
15. G. cordata var. nealiae (Fosb.) Deg. & Deg., was G. t. var. cordata f. nealae [sic] Fosb. ibid. 147: 45. 1937. (Maui). The orthography has been corrected to meet the requirements of recommendation 73C(b) of the Code.
16. G. crassicaulis (Fosb.) Deg. & Deg., was G. t. var. crassicaulis Fosb. ibid. 147: 56. 1937. (Maui).
17. G. degeneri (Fosb.) Deg. & Deg., was G. t. var. degeneri Fosb. ibid. 147: 39. 1937. (Oahu).
18. G. elongata var. hirtellicostata (Fosb.) Deg. & Deg., was G. t. var. elongata f. hirtellicostata Fosb. ibid. 147: 33. 1937. (Kauai).
19. G. elongata var. kahiliensis (Fosb.) Deg. & Deg., was G. t. var. elongata f. kahili [sic] Fosb. ibid. 147: 33. 1937. (Kauai). The orthography has been corrected to meet the requirements of recommendation 73D of the Code.
20. G. forbesii (Fosb.) Deg. & Deg., was G. t. var. forbesii Fosb. ibid. 147: 57. 1937. (Hawaii).
21. G. fosbergii Deg. & Deg., was G. sandwicensis var. arborescens Wawra in Flora 57 (18): 276. 1874, not G. arborescens (Wawra) Heller in Minn. Bot. Stud. 1: 896. 1897; G. t. var. arborescens f. euarborescens Fosb. in Bull. Bishop Mus. 147: 31. 1937. (Kauai).
22. G. fosbergii var. albicaulis (Fosb.) Deg. & Deg., was G. t. var. arborescens f. albicaulis Fosb. ibid. 147: 32. 1937. (Kauai).
23. G. fosbergii var. macrophylla (Fosb.) Deg. & Deg., was G. t. var. arborescens f. macrophylla Fosb. ibid. 147: 32. 1937. (Kauai).
24. G. glabra (Fosb.) Deg. & Deg., was G. t. var. glabra f. euglabra Fosb. ibid. 147: 36. 1937. (Hawaii).
25. G. glabra var. parvithyrsa (Fosb.) Deg. & Deg., was G. t. var. glabra f. parvithyrsa Fosb. ibid. 147: 36. 1937. (Hawaii).
26. G. glabra var. waipioensis (Fosb.) Deg. & Deg., was G. coriacea

- var. e Hillebr. Fl. Haw. Isl. 168. 1888. (Hawaii)
27. G. hathewayi (Fosb.) Deg. & Deg., was G. t. var. hathewayi Fosb. in Brittonia 8 (3): 174. 1956. (The correct spelling for the locality is Mokuleia, not "Moluleia", Oahu).
 28. G. hosakae (Fosb.) Deg. & Deg., was G. t. var. hosakai [sic] Fosb. in Bull. Bishop Mus. 147: 38. 1937. (Hawaii). The orthography has been corrected to meet requirements of recommendation 73C(a) of the Code.
 29. G. kaalana (Fosb.) Skottsb., was G. t. var. kaala [sic] Fosb. *ibid.* 147: 49. 1937, and G. kaala [sic] Skottsb. in Acta Horti Gotob. 15: 466. 1944. The specific orthography has been altered by us because of the mandate expressed by Article 73, Note 3 and Recommendation 73D of the Code.
 30. G. kapuaensis (Fosb.) Deg. & Deg., was G. t. var. kapuaensis f. eukapuaensis Fosb. *ibid.* 147: 39. 1937. (Hawaii).
 31. G. kapuaensis var. pittosporoides (Fosb.) Deg. & Deg., was G. t. var. kapuaensis f. pittosporoides Fosb. *ibid.* 147: 39. 1937. (Hawaii).
 32. G. kapuaensis var. rigidifolia (Fosb.) Deg. & Deg., was G. t. var. kapuaensis f. rigidifolia Fosb. *ibid.* 147: 39. 1937. (Hawaii).
 33. G. kapuaensis var. rigidifolioides (Fosb.) Deg. & Deg., was G. t. var. kapuaensis f. rigidifolioides Fosb. in Brittonia 8 (3): 174. 1956. (Hawaii).
 34. G. kapuaensis var. violetiae (Fosb.) Deg. & Deg., was G. t. var. kapuaensis f. violetae [sic] Fosb. in Bull. Torr. Bot. Club 70: 392. 1943. (Hawaii). The varietal name, here corrected to meet requirements of the Code, honors the collector, Mrs. F. R. Fosberg.
 35. G. konaensis (Fosb.) Deg. & Deg., was G. t. var. konaensis f. eukonaensis Fosb. in Bull. Bishop Mus. 147: 38. 1937. (Hawaii).
 36. G. konaensis var. latifolia (Fosb.) Deg. & Deg., was G. t. var. konaensis f. latifolia Fosb. *ibid.* 147: 38. 1937. (Hawaii).
 37. G. lanaiensis (Fosb.) Deg. & Deg., was G. t. var. lanai [sic] Fosb. *ibid.* 147: 59. 1937. (Lanai). The orthography is changed according to mandates of the Code.
 38. G. macrocarpa var. cuneata (Fosb.) Deg. & Deg., was G. sandwicensis var. hirtella forma alpha Wawra in Flora 57 (19): 295. 1874, and G. t. var. macrocarpa f. cuneata Fosb. in Bull. Bishop Mus. 147: 35. 1937. (Kauai).
 39. G. macrocarpa var. sambucina (Heller) Deg. & Deg., was G. sambucina Heller in Minn. Bot. Stud. 1: 898. 1897. (Kauai).
 40. G. macrocarpa var. sclerophylla (Fosb.) Deg. & Deg., was G. t. var. macrocarpa f. sclerophylla Fosb. in Bull. Bishop Mus. 147: 35. 1937. (Kauai).
 41. G. macrocarpa var. teres (Fosb.) Deg. & Deg., was G. t. var. macrocarpa f. teres Fosb. *ibid.* 147: 36. 1937. (Kauai).

42. G. munroi (Fosb.) Deg. & Deg., was G. st.-johnii var. munroi Fosb. ibid. 147: 63. 1937. (Lanai).
43. G. myrsinoidea (Fosb.) Deg. & Deg., was G. t. var. myrsinoidea Fosb. in Brittonia 8 (3): 176. 1956. (Hawaii).
44. G. osteocarpa (Fosb.) Deg. & Deg., was G. arborescens Heller in Minn. Bot. Stud. 1: 896. 1896, not G. sandwicensis var. arborescens Wawra in Flora 57 (18): 276. 1874, but G. t. var. osteocarpa Fosb. in Bull. Bishop Mus. 147: 33. 1937. (Kauai).
45. G. ovata (Wawra) Skotts. (not a nomen nudum as expressed by Fosberg because Skottsberg, according to Article 32 of the Code, referred to a previously, effectively published description in his Acta Horti Gotob. 15: 465. 1944), was G. sandwicensis var. ovata Wawra in Flora 57 (18): 278. 1864. (Maui). This new specific name should legitimize, if there should be any doubt, the following trivial taxa for which the proper synonymy is found in Fosberg, Bull. Bishop Mus. 147. 1937, and cited by us in our articles appearing in Phytologia 6: 466. 1961 and/or 14: 213-215. 1967: vars. heterophylla (Molokai), lydgatei (Maui), makawaoensis (Maui), membranacea (Maui), oahuensis (Oahu), obovata (Lanai), petiolata (Molokai), santalifolia (Maui), storeyi (Molokai), suehironae (Molokai), and wailauensis (Molokai) nobis.
46. G. ovata var. kalaupapana (Fosb.) Deg. & Deg., was G. t. var. ovata f. kalaupapa [sic] Fosb. in Bull. Bishop Mus. 147: 51. 1937, and G. ovata var. kalaupapa [sic] (Fosb.) Deg. & Deg. in Phytologia 7: 466. 1961. (Molokai).
47. G. ovata var. maunahuiensis (Fosb.) Deg. & Deg., was G. t. var. ovata f. maunahui [sic] Fosb. in Bull. Bishop Mus. 147: 51. 1937, and G. ovata var. maunahui [sic] (Fosb.) Deg. & Deg. in Phytologia 7: 466. 1961. (Molokai).
48. G. ovata var. oahuensis (Fosb.) Deg. & Deg., was G. t. var. ovata f. oahuensis Fosb. in Brittonia 8 (3): 176. 1956.
49. G. ovata var. punaulana (Fosb.) Deg. & Deg., was G. t. var. ovata f. punaula [sic] Fosb. in Bull. Bishop Mus. 147: 53. 1937. (Molokai).
50. G. ovata var. russii (Fosb.) Deg. & Deg., was G. t. var. kaala [sic] f. russii Fosb. ibid. 147: 49. 1937, and G. t. var. ovata f. russii Fosb. in Brittonia 8 (3): 176. 1956. (Oahu).
51. G. parvifolia (Wawra) Deg. & Deg., was G. sandwicensis var. parvifolia Wawra in Flora 57 (19): 296. 1874. (Maui).
52. G. parvifolia var. subpilosa (Fosb.) Deg. & Deg., was G. terminalis var. parvifolia f. subpilosa Fosb. in Bull. Bishop Mus. 147: 56. 1937. (Maui).
53. G. parvula var. impressa (Fosb.) Deg. & Deg., was G. t. var. parvula f. impressa Fosb. in Bull. Torr. Bot. Club 70: 391. 1943. (Maui).

54. G. pedunculata (Fosb.) Deg. & Deg., was G. t. var. pedunculata Fosb. in Bull. Bishop Mus. 147: 46. 1937. (Hawaii).
55. G. pseudodichotoma (Fosb.) Deg. & Deg., was G. terminalis var. pseudodichotoma Fosb. *ibid.* 147: 58. 1937. (Lanai).
56. G. pubescens (Fosb.) Deg. & Deg., was G. t. var. pubescens Fosb. *ibid.* 147: 57. 1937. (Maui).
57. G. quadrangularis (Fosb.) Deg. & Deg., was G. t. var. quadrangularis Fosb. *ibid.* 147: 56. 1937. (Hawaii).
58. G. rotundifolia (Fosb.) Deg. & Deg., was G. t. var. rotundifolia Fosb. *ibid.* 147: 41. 1937. (Molokai).
59. G. sclerotica (Fosb.) Deg. & Deg., was G. t. var. sclerotica Fosb. in Brittonia 8 (3): 175. 1956. (Hawaii).
60. G. skottsbergii (Fosb.) Deg. & Deg., was G. t. var. skottsbergii Fosb. in Bull. Bishop Mus. 147: 42. 1937. (Hawaii).
61. G. stipulacea (Wawra) Deg. & Deg., was G. sandwicensis var. stipulacea Wawra in Flora 57 (19): 297. 1874. (Kauai).
62. G. stipulacea var. rockii (Fosb.) Deg. & Deg., was G. terminalis var. stipulacea f. rockii Fosb. in Bull. Bishop Mus. 147: 43. 1937. (Kauai).
63. G. subcordata (Fosb.) Deg. & Deg., was G. t. var. subcordata Fosb. *ibid.* 147: 44. 1937. (Lanai).
64. G. tenuicaulis (Fosb.) Deg. & Deg., was G. t. var. tenuicaulis Fosb. *ibid.* 147: 57. 1937. (Kauai).
65. G. wawrae (Fosb.) Deg. & Deg., was G. t. var. wawrana [sic] Fosb. *ibid.* 147: 30. 1937. (Oahu). The specific orthography for the Viennese physician Heinrich Wawra is here corrected to wawrae according to Recommendation 73C(a) of the Code.
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A NEW NAME AND COMBINATION IN BAUHINIA (LEGUMINOSAE)

R. P. WUNDERLIN*

During the course of study of the genus Bauhinia Section Bauhinia the author has found it necessary to change several taxa, resulting in the following new name and new combination:

BAUHINIA MACRANTHERA Benth. ex Hemsl. var. GRAYANA Wunderlin,
nom. nov.

Bauhinia lunarioides Gray, in S. Wats. Bibl. Index 205.
1873. Nom. nud.

Casparea lunarioides Gray ex Britton & Rose, N. Amer. Fl.
23:212. 1930. Nom. illegit.

BAUHINIA DIPETALA Hemsl. var. DESERTI (Britton & Rose) Wunder-
lin, comb. nov.

Casparea deserti Britton & Rose, N. Amer. Fl. 23:216.
1930.

Bauhinia deserti (Britton & Rose) Lundell, Vegetation of
Petén 211. 1937.

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THE RUBIACEAE OF CERRO JEFE, PANAMA

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Cerro Jefe is a low mountain located in the Province of Panama in the Republic of Panama. It lies immediately northwest of Tocumen Airport and is about thirteen miles south of Goofy Lake. It favors the Pacific side of the Continental Divide and rises to only 2900 or 3000 ft elevation. It is easily accessible on foot. During the rainy season it is dangerous to drive there except in a heavy traction vehicle. Its summit is mist swept or rain swept throughout most of the year. The trees rarely exceed twenty five feet in height with Clusia dominating the upper story. The dominant phanerogams appear to be species of Bromeliaceae, Rubiaceae, and Melastomaceae.

Paul Allen in 1946 made several collections on Cerro Jefe; two of these I have seen: Terminalia amazonica (Gmel.) Exell (#3436) and Clethra lanata M. & G. (#3437). Within the last three years the summit has been visited by a number of botanists, especially by Edwin Tyson, Kurt Blum, Robert Godfrey, J. Duke, and J. Dwyer.

The following is a list of the species of Rubiaceae collected thus far on the summit of Cerro Jefe; numbered among these are the new species described in this paper. Recent collections on Cerro Jefe on March 12, 1967 by J. Dwyer, G. Gauger, and K. Baker should yield additional new species of Rubiaceae. Herbarium material is deposited in the Missouri Botanical Garden and in the U.S. Army Tropic Test Center, Miraflores Annex, Canal Zone.

Borreria laevis (Lam.) Griseb.
Cephaelis elata Sw.
Cephaelis tomentosa Aubl.
Chiococca alba (L.) Hitch.
Coccocypselum glabrum DC.
Dukea panamensis Dwyer
Faramea jefensis Dwyer & Hayden
Faramea loftonii Dwyer & Hayden
Faramea papillata Dwyer & Hayden
Genipa vulcanicola Standley
Geophila herbaceum (Jacq.) Schum.
Hillia tetrandra Sesse & Moc.
Isertia hypoleuca Benth.
Ixora floribunda (Rich.) Griseb.
Ladenburgia sp.

Palicourea guianensis Aubl.
Palicourea tysonii Dwyer & Hayden
Psychotria capitata R. & P.
Psychotria erecta (Aubl.) Standley & Steyermark
Psychotria luxurians Rusby
Psychotria pithecobia Standley
Psychotria racemosa (Aubl.) Willd.
Psychotria suerrensii D. Sm.
Rondeletia salicifolia Dwyer & Hayden
Sabicea villosa R. & S.

Below are the new species found on the summit of Cerro Jefe together with taxa representing noteworthy range extensions into or within Panama.

1. *CHIONE BUXIFOLIA* Dwyer & Hayden, sp. nov.

Frutex ad 3 m altus, omnino glaber, ramulis teretibus laevibus ultime rimosis. Folia stipulis ad 4 mm longis, lamina elliptica vel rhombico-elliptica, 2-4 cm longa, 1.5-2.8 cm lata, apice obtuso-acuta vel rotundo-obtusa, basi cuneata, coriacea supra plus fusca nitido-laeve, costa supra plana subtus prominula, venis lateralibus 4 bene ascendentibus subtus evanescentibus in sicco supra depressis, marginibus conspicue revolutis. Inflorescentiae breves, ad 2.5 cm longae, ca 2.5 cm latae, pedunculo ad 1.3 cm longo, ramulis primariis ternate dispositis, ad 1 cm longis, pedicellis (hic in fructu) ad 0.5 cm longis. Flores non visi. Fructus elliptici, ad 1.5 cm longi, 0.75 cm lati, in sicco nigri apice obtusi, lobulis calycis 4 persistentibus minutis, ad 1 mm longis, vel nullis, seminibus solitariis durissimis magnis, endospermo biporoso (sect. trans.).

PANAMA: Cerro Jefe, 2700-3000 ft elev, Tyson, Dwyer & Blum 3291 (MO, Holotype).

The stony drupaceous fruit whose endosperm is biporous in cross-section readily distinguishes this as a Chione, a genus which is limited to a few species in Mexico and Central America. The nearest relatives geographically are: Chione panamensis Steyermark from Cerro Horqueta, Prov. Chiriqui, Panama. It occurs at a much higher altitude (6500 ft) and has much larger leaves with the secondary veins more numerous and prominent beneath. Chione guatemalensis Standley & Steyermark has extraordinary large leaves borne on elongate petioles.

2. *FARAMEA JEFENSIS* Dwyer & Hayden, sp. nov.

Frutex ad 7 m altus, ramulis fortiter arcuato-ascendentibus in siccis nigris, nodis dilatatis minute ciliolatis. Folia stipulis elongato-cylindricis omnino amplexicaulis, 2.5 cm longis, vagina apice acuta minute puberula, petiolis ad 0.8 cm longis; lamina anguste elliptica, 9-15 cm longa, 2-4.5 cm lata, apice longe cuspidata, cuspidate ad 1.5 cm longa, ca 1.5 cm lata, basi cuneata, saepe inaequilateralis, coriacea laevis glabrescens, venis lateralibus ca 20, vix arcuatis subtus gracili-prominulis, vena marginale irregulari-undulata a margine ca 3 mm distante, marginibus vix crassis. Inflorescentiae contracto-cymoso-paniculatae, ad 2.5 cm longae, ad 3 cm latae, pedunculo vix deficiente, carnosae, ca 3 mm lato, ramis ascendentibus, bracteis foliaceis ovatis, 2-4 cm longis, 1-2 cm latis, apice longe cuspidato, cuspidate ad 0.8 cm longo, glabris, variegatis in laminae medio albis, marginibus viridibus, eis omnino basin inflorescentiae tegentibus. Flores pallide azurei, pedicellis ad 3 mm longis, hypanthio calyceque ad 6 mm longo, glabro; calyx cupulatus, ad 1.5 mm longus et ca 2 mm latus, dentibus 4, minutis; corolla apice in gemmis clavata, tubo cylindrico, 9-12 mm longo, lobis 4, triangularibus (trans. sect.), ad 8 mm longis, crassis; antherae 4, 3.5-4 mm longae, infra medium tubi affixae; ovarium septo integro, parte superiore deficiente, ovulis 2, suborbicularibus, in parte connatis, stylo ca 8 mm longo, stigmatibus linearibus, ca 2 mm longis, erectis minute papillatis. Fructus non visi.

PANAMA: Cerro Jefe: 2700-3000 ft alt, Tyson, Dwyer & Blum 3396 (MO, Holotype); Dwyer, Gauger & Baker 7279 (MO).

K. Schuman (in Engl. & Prantl, Pflanzenfam. (4) 135. 1891) divided Faramea into 4 sections: Homocladus Muell.-Arg., Hypochasma Muell.-Arg., Tetramerium DC., and Eufaramea Muell.-Arg.. Only sect. Hypochasma has the stipules connate, the sheath being small and being truncate or with minute awns. The stipules of F. jefensis would seem to favor this section, except that they are not small but measure up to 2.5 cm in length. Thus it would seem appropriate to describe a new section for the genus Faramea: Section Grandistipulata (Sectio Grandistipulata Dwyer & Hayden, sect. nov.: stipulae magnae connatae; bractee magnae foliaceae.

3. *FARAMEA LOFTONII* Dwyer & Hayden, sp. nov.

Frutex, ramulis quadrangularibus laevibus glabris. Folia stipulis triangularibus, ad 4 mm longis, basi connatis, coriaceis

petiolis 0.3-0.5 cm longis, glabris, anguste alatis; lamina falcato-angusto-elliptica, 10-12 cm longa, 3-4 cm lata, apice acuta, ultime vix acuminata vel conspicue acuminata, acumine ad 0.7 cm longo, rare falcate disposito, basi acuta, papyracea, supra glabra, venis lateralibus 10-12, late arcuatis prominulis, venis intermediis grandibus irregularibus, multis areolis patulis, reticulatis. Inflorescentiae terminales, ad 4 cm longae, ad 4 cm latae, cymoso-paniculatae, pedunculo ad 2 cm longo, 0.15 cm lato, glabro, ramis 3-4 divergentibus vel ascendentibus, ad 1.2 cm longis, cymulis terminalibus 3-6 flores ferentibus, bracteis inferioribus rare persistentibus lineari-ellipticis, ad 15 mm longis, ca 1.5 mm latis, rigidis glabris venosis. Flores albi, pedicellis 1.5-3 mm longis, glabris; hypanthium ca 0.5 mm longum; calyx urceolatus, ca 1.3 mm longus, truncatus, dentibus evanescentibus; corolla tubo cylindrico, ca 10 mm longo, lobis 4 crassis, 5-6 mm longis; antherae oblongae, ca 4 mm longae, obtusae, filamentis proxime medium tubi affixis; ovarium septo basi locali disposito atque gracili, ovulis 2, dorsaliter contiguus (long. sect.), stylo 11-12 mm longo, stigmatibus nigris marcescentibus papillatis. Fructus non visi.

PANAMA: Cerro Jefe, 2700-3000 ft alt, Tyson, Dwyer & Blum 3323 (MO, Holotype)

The new species resembles F. talamancarum Standley known from Bocas del Toro, Panama and adjacent Costa Rica. It differs in having thinner leaves which are not ovate in shape or conspicuously caudate at the apex. The flowers of the new species are white, while they are blue in F. talamancarum.

The species is named in honor of Dr. Horace Loftin of Florida State University who has contributed much to the biology of Panama and was one of the first scientists to recognize the biological richness of the summit of Cerro Jefe.

14. FARAMEA PAPILLATA Dwyer & Hayden, sp. nov.

Frutex ad 3 m altus, omnino glaber, ramulis subplano-compressis. Folia stipulis basi connatis, dimorphis vel parvis compresso-rotundis, apice elongato-cuspidatis, cuspidate ad 0.25 cm longa, vel ellipticis, ad 0.7 cm longis, acuminatis, cicatricibus stipularum conspicuis, ad 0.4 cm longis, petiolis 1-1.5 cm longis; lamina elliptica, 12-14.5 cm longa, 5.5-7.5 cm lata, apice rotundata ultime obtusa, coriacea nitida in sicco bullata vel papillata bicolor, costa subtus prominente, venis lateralibus 10-12 arcuatis, vena marginale conspicua irregulari-undulata, a margine ca 5 mm distante, areolis subtus prominentibus. Inflorescentiae terminales umbelliformi-paniculatae, ad 5.5 cm

longae, ad 6 cm latae, pedunculo laeve, ad 1.6 cm longo, ca 0.3 cm lato, ramis primariis ⁴ aequalibus rigide forteque ascendentibus, ramis terminalibus ternate dispositis, aequalibus, ca 1 cm longis, floribus in utroque ramulo ternate dispositis. Flores hypanthio urceolato, ad 3 mm longo, in sicco nigro; calyx coronarius, ca 1 mm longus (in fructu immaturo ad 4 mm longo) brunneus, margine undulato, dentibus evanescentibus; petala staminaque non visa; ovarium ovulis 2, semiorbicularibus contiguis, septo evanescente. Fructus (hic immaturi) subrotundi, ad 0.5 cm longi, in sicco nigri laeves glabri.

PANAMA: Cerro Jefe, 2700-3000 ft elev, Tyson, Dwyer & Blum 3284 (MO, Holotype); Tyson, Dwyer & Blum 3381 (MO)

The new species is probably assignable to Section Tetramerium of Faranea as the calyx (in the flowering stage) is small, the stipules are aristate and the cymules are non fasciate. The ternately disposed branches of F. papillata are striking.

Faranea bullata Standley, based on a collection by G.P. Cooper (#509) from Bocas del Toro, Panama, and also known from Colombia (Cuatrecasas 16997) has leaves which are similarly bullate. The leaves, however, are much more elongate than in the new species and are markedly 3-plinerved.

5. GENIPA VULCANICOLA Standley, Field Mus. Publ. Bot. 17: 213. 1917.

PANAMA: Cerro Jefe: Duke 8026 (MO); Tyson 3397 (MO); Tyson, Dwyer & Blum 4441 (MO)

This is the first report of the species in Panama. It was described from Guatemala.

6. HILLIA TETRANDRA Sesse & Moc., Fl. Mex. ed 2. 84. 1893.

PANAMA: Coclé: Cerro Valle Chiquito, 700-800 ft elev, Seibert 495 (MO); Panama: E slope Cerro Jefe, 2700 ft elev, Tyson 3436 (MO)

7. RONDELETIA SALICIFOLIA Dwyer & Hayden, sp. nov.

Frutex ramulis glabris. Folia stipulis triangularibus, 2-3 mm longis, integris persistentibus, subsessilia; lamina anguste elliptica, 7.5-10 cm longa, ad 4 cm lata, elongato-acuminata, acumine ad 1.5 cm longo, saepe falcate disposito, basi acuta, membranacea, supra glabra subtus in venis minute pubescens, venis lateralibus 5-6 supra evanescentibus subtus prominulis, areolis

reticulatis. Inflorescentiae terminales cymoso-pyramidato-paniculatae ca 1.5 cm longae, ca 1.5 cm latae, pedunculo pubescente, 2-2.5 cm longo, ramulis ternate dispositis, bracteis bracteolisque conspicue petaloideis, bracteis lineari-ellipticis, ad 7 mm longis, bracteolis crebre circum flores dispositis, Flores albi; hypanthium ellipticum, ca 1.5 mm longum, pubescens; calyx lobis 4, 2-3 in longitudine aequalibus, uno vel duobus petaloideis, lobis minoribus linearibus, ca 3 mm longis, maioribus ovatis, ad 7 mm longis, apice late acutis, pubescentibus venosis; corolla tubo cylindrico, ca 3 mm longo (hic immaturo), apice conspicue clavato, basi intus minutissime pubescentibus, lobis forte imbricatis suborbicularibus, hic quam tubo brevioribus, ca 1 mm longis; antherae 4 sessiles lineares, in medio tubi affixae; ovarium biloculare, septo crasso, placentis axillaribus, ovulis numerosissimis planis suborbicularibus, stigmatibus linearibus, hic tubo aequalibus, vix reflexis. Fructus non visi.

PANAMA: Cerro Jefe, 2700-3000 ft elev, Tyson, Dwyer & Blum 3319 (MO, Holotype)

Superficially the crowded expanded bracteoles which envelop the cymules resemble those of Cephaelis. Presumably there are two bracteoles per flower. The striking inequality in length of the calycine lobes is unique for the Central American species of Rondeletia. On boiling, the inflorescence yields a red pigment.

8. SCHRADERA BLUMII Dwyer & Hayden, sp. nov.

Frutex scandens, ramulis quadrangularibus laevibus glabris rimosis. Folia stipulis caducis, cicatricibus stipularum conspicuis, ca 1 mm longis, nodis 2-5 cm distantibus, petiolis 1.5-2.5 cm longis, rigidis glabris; lamina angusto-oblonga, saepe falcato-oblonga, 7-10 cm longa, 3-4 cm lata, apice acuta vix acuminata, basi acuta et plerumque paullo inaequilaterale carnosocoriacea glabra venis lateralibus rigide ascendentibus, supra evanescentibus subtus prominulis, areolis patulo-reticulatis, marginibus leviter revolutis. Inflorescentiae terminales in sicco nigrae, ad 4.5 cm longae, pedunculo ad 2 cm longo, ca 0.25 cm lato, floribus in unum globosum cymuloso-capitulum aggregatis, bracteis in sicco nigris, in cupulum ca 2.5 cm latum conjunctis, marginibus undulatis. Flores hypanthio oblongo-rotundo (hic in fructu immaturo), ad 10 mm longo, glabro; calyx cylindrico-urceolatus, ad 8 mm longus, truncatus, dentibus deficientibus, ovario biloculato, septo medio, placentis axillaribus. Fructus non vidimus praeter semina immatura, eis multis planis elongatis ellipticis, 1-1.3 mm longis, obtusis, testa minute favosa.

PANAMA: Cerro Jefe, 2700-3000 ft elev, Tyson, Dwyer & Blum 3218 (MO, Holotype)

This is the first report of this little known genus north of South America. The species is named in honor of Mr. Kurt Blum who has collected herbarium material on Cerro Jefe on several occasions.

9. *PSYCHOTRIA LUXURIANS* Rusby, Mem. Torrey Bot. Club 6: 50. 1896.

PANAMA: NE slope Cerro Jefe on road to Buenos Aires, 2600 ft elev, Tyson, Dwyer & Blum 3255 (MO); E slope Cerro Jefe, Tyson 3429 (MO); summit Cerro Jefe, Dwyer, Gauger & Baker 7298 (MO).

Psychotria luxurians has been collected in only two Provinces of Panama, Darien and Panama. Presumably Panama represents the most northern range of the species. The Darien collection was made by M.E. Terry & R.A. Terry (#1524) on the Cana-Cuasi Trail at 4000 ft elev.. The only other collection in the Province of Panama was made by Sister M. Victoria Hayden on Cerro Campana (#119). The species has been reported from Peru and Ecuador (Standley, Field Mus. Nat. Hist. Bot. 7: 307. 1931) and is known from several collections by Bang and Buchtien in Bolivia.

CONTRIBUTION TO THE BRYOPHYTES OF THAILAND, I.

Clyde F. Reed* and Harold Robinson**

The present paper gives the results of a review of various collections of bryophytes sent to the senior author by the Curator of the Forest Herbarium, Royal Forest Department, Bangkok, Thailand. The specimens have been collected by various workers dealing with the Flora of Thailand project. The specimens, many of which were already named, have been identified or verified by the junior author and an attempt has been made to adopt names and species concepts consistent with recent papers and monographs cited. In a few cases synonymy is assumed on the bases of descriptions. The original specimens are in the Forest Herbarium in Bangkok. Duplicates are in the United States National Herbarium, Washington, D.C. and/or in the Reed Herbarium, Baltimore, Maryland.

The following list includes 8 species of hepaticae (with two new combinations) and 55 species of Musci. Ecological data in regard to elevation and substrata are included where available.

HEPATICAE

Lepidoziaceae

Bazzania desciscens (Steph.) Robinson, comb. nov. (Mastigobryum desciscens Steph., Bull. Herb. Boiss., II, 8: 862-863. 1908). Peninsula: Nakawn Srithamarat, Khao Luang, elev. 1600 m. June 25, 1953. Phloenchit 594 A. (Flora of Thailand 1172A).

Bazzania spiralis (Reinwardt, Blume et Nees) Robinson, comb. nov. (Jungermannia spiralis R., Bl. et N., Nova Acta Acad. Leop.-Carol., 12: 231. 1824. Peninsula: Nakawn Srithamarat, Khao Luang, on wet log. June 25. 1953. Phloenchit 593. (Flora of Thailand 1171).

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Frullaniaceae

Frullania tamarisci (L.) Dum., subsp. moniliata (R., Bl. et N.) Kamim. Central: Khao Khio, Khao Yai, N. Rachasima, elev. 1400 m., on twigs and shrubs. Nov. 11, 1963. Tem Smitinand 8406.

Lejeuneaceae

Caulalejeunea fruticosa (L. et G.) Steph. Southeast: Trad, Chang Klav, Hui Rang, elev. 50 m., on branches of Mangifera indica, in village. Jan. 26, 1952. Tem Smitinand 1447. (Flora of Thailand 6670).

Cololejeunea oshimensis (Horik.) Benedix Central: Khao Khio, Rachasima, elev. 1400 m., on leaves in evergreen forest. Nov. 11, 1963. Tem Smitinand 8419A.

Colura acroloba (Mont.) S.J.A. Central: Khao Khio, Rachasima, elev. 1400 m., on leaves in evergreen forest. Nov. 11, 1963. Tem Smitinand 8419B.

Thysananthus aculeatus Herz. Peninsula: Khao Luang, Nakawn Srithamarat, elev. 600 m., on bark of tall tree, in hill evergreen forest. Nov. 5, 1959. Tem Smitinand 1027. (Flora of Thailand 5816).

Schistochilaceae

Schistochila aligera (Nees) Steph. Peninsula: Nakawn Srithamarat, Khao Luang, elev. 1600 m., on wet log on hill ridge. June 25, 1953. Phloenchit 594B. (Flora of Thailand 1172B); Kiriwong, Khao Luang, on tree trunk in evergreen forest. Aug. 5, 1951. Tem Smitinand 886. (Flora of Thailand 5775).

MUSCI

Sphagnaceae

Sphagnum junghuhnianum Doz. et Molk. Northeast: Phu Krading, elev. 1200 m., on moist rock in canyon, 4 km. NW of Rock Cabin. Feb. 28, 1959. Th. Sorensen, Kai Larsen & B. Hansen. (Flora of Thailand 6457).

Sphagnum khasianum Mitt. Northeast: Phu Krading, elev. 1200 m., on wet soil near waterfall, 4 km. NW of Rock Cabin. Feb. 28, 1959. Th. Sorensen & Kai Larsen. (Flora of Thailand 6452). Fitting the broad concept of S. subsecundum Nees. Det. by B. Hansen as S. luzonense Warnst.

Sphagnum palustre L. Northeast: Phu Krading, elev. 1200 m., on wet soil at stream near Rock Cabin. Feb. 29, 1952. Kai Larsen & Bertel Hansen. (Flora of Thailand 6460); Loei, Phu Krading, Huay Hinkong, elev. 1300 m., common among grasses on moist rocky ground in pine forest. Mar. 12, 1952. Tem Smitinand 1158. (Flora of Thailand 6653). Det. by P. Arens as S. siamense Dix., and by G.O.K. Sainsbury as S. pseudocymbifolium C.Mull.; Phu Krading, elev. 1200 m. Mar. 19, 1958. Th. Sorensen & Kai Larsen. (Flora of Thailand 2371). Det. Bertel Hansen.

Fissidentaceae

Fissidens hollianus var. semperfalcatus (Dix.) Norkett. (F. semperfalcatus Dix., det. by E.B. Bartram). Southeast: Chantaburi, Makham, Khao Mai Kaew, elev. 120 m., moss on ant-hill in moist locality. Oct. 6, 1954. Bunnak 258. (Flora of Thailand 9377).

Ditrichaceae

Garckea phascoides (Hook.) C.Mull. Northern: Chiangmai, Mae Tang, Ban Mae Talai, elev. 445 m., on wet ground. Sept. 21, 1964. R. Suvarnasara 66.

Wilseniella pellucida var. acutifolia (Broth.) Dix. Central: Saraburi, Nam Tok, Sam Lan, on sandy ground. Nov. 14, 1964. R. Suvarnasara 71; Northern: Chiangmai, Mae Tang, Ban Mae Talai, elev. 445 m., on wet ground. Sept. 21, 1964. R. Suvarnasara 69; (Selangor, Batu Caves, Dixon, p. 3. 1926, as Wilseniella acutifolia Broth., ined.).

Dicranaceae

Campylopus gracilis (Mitt.) Jaeg. (?) Northern: Chiangmai, Haud, Baw Luang, elev. 1434 m., on wet ground. Sept. 27, 1964. R. Suvarnasara 60.

Campylopus richardii (Schwaegr.) Brid. sensu Dixon, as det. by H. Robinson; det. by P. Arens as C. serrulatus Lac.; det. by Sainsbury as C. siamensis Dix.; det. by Bartram as C. umbellatus (Arn.) Bartr.). Northeast: Loei, Phu Krading, Huay Hinkawng, elev. 1300 m., on rocks along edge of precipice. Mar. 12, 1952. Tem Smitinand 1156. (Flora of Thailand 6652).

Dicranella brasiliensis (Dub.) Bartr. Northeast: Chiangmai, Haud, Baw Luang, elev. about 1434 m., on wet ground. Sept. 27, 1964. R. Suvarnasara 61.

Leucoloma molle (C.Mull.) Mitt. Southeast: V. Chanburi, Pong Nanrawn, Khao Soidao, elev. 1700 m., on tree trunks in hill evergreen forest. Jan. 23, 1956. Tem Smitinand 3227. (Flora of Thailand 14803).

Leucobryaceae

Leucobryum bowringii Mitt., var. sericeum (Broth.) Dix. Northeast: Loei, Phu Krading, Dawn Pawai, elev. 1300 m., on roots of trees in hill evergreen forest. Mar. 8, 1952. Tem Smitinand 1098. (Flora of Thailand 6646). Det. G.O.K.Sainsbury.

Leucobryum javense (Brid.) Mitt. Northeast: Loei, Phu Krading, Thamsaw, elev. 1300 m., common on dry rocks by stream along edge of pine forest. Mar. 9, 1952. Tem Smitinand 1104. (Flora of Thailand 6637). Det. by P. Arens; Central: Khao Khio, Khao Yai, Rachasima, elev. 1400 m., moss on tree. Nov. 11, 1963. Tem Smitinand 8409.

Leucobryum scalare C.Mull. Southeast: Trat, Kaw Chang, Khao Nang Aen, elev. 190 m., on decaying log in moist locality. Mar. 20, 1955. Bunnak 375. Det. E.B.Bartram as L. aduncum Doz. et Molk.; Northeast: Loei, Phu Krading, Thamsaw, elev. 1300 m., on bark on oak trees in pine-oak forest. Mar. 10, 1952. Tem Smitinand 1112. (Flora of Thailand 6644); same loc., on oak trees. Oct. 11, 1954. Tem Smitinand 2001. (Flora of Thailand 12227). Det. by Bartram as L. bowringii Mitt.

Octoblepharum albidum Hedw. Northeast: Loei, Phu Krading, Thamsaw, elev. 1300 m., on bark of oak trees. Mar. 10, 1952. Tem Smitinand 1113. (Flora of Thailand 6634). Det. by G.O.K.Sainsbury.

Calympereaceae

Syrrhopodon albovaginatus Schwaegr. Peninsula: Surat, Bangbao, elev. less than 100 m., on wet bog in evergreen jungle. Aug. 6, 1955. Tem Smitinand 2823. (Flora of Thailand 12711). Det. by E.B.Bartram.

Pottiaceae

Hyophila involuta (Hook.) Jaeg. Southeast: Chanburi, Khlung, Makawk, elev. 130 m., on moist rocks. Oct. 28, 1954. Bunnak 291. (Flora of Thailand 9359). Det. E.B.Bartram.

Funariaceae

Funaria hygrometrica Hedw., var. calvescens (Schwaegr.) Mont. (F. calvescens Schwaegr., det. by E.B.Bartram). Northeast:

Loei, Phu Krading, elev. 1300 m., common on earth in pine forest. Oct. 1, 1954. Tem Smitinand 1997. (Flora of Thailand 1223); Central: I. Phetchabun, Lomkao, Namnao, elev. 600 m., in earth along edge of evergreen forest. May 22, 1951. Tem Smitinand 505. (Flora of Thailand 5143).

Bryaceae

Bryum coronatum Schwaegr. Southeast: Chanturi, Makham, elev. 130 m., on rocks in moist locality. Nov. 1, 1954. Bunnak 297. (Flora of Thailand 9509).

Bryum garutense Fleisch. (?) Northeast: Loei, Phu Krading near Rest Home, elev. 1300 m., common on stones. July 8, 1959. Tem Smitinand 5885. (Flora of Thailand 24121). Det. by F. Floto as B. sericeum ?

Rhodobryum roseum (Hedw.) Limpr. Northeast: Loei, Phu Krading, Sam Khae, elev. 1100 m., erect moss on rocks in hill evergreen forest. Mar. 30, 1952. Tem Smitinand 1256. (Flora of Thailand 7785). Det. G.O.K. Sainsbury.

Mniaceae

Orthomnion bryoides (Griff.) Norkett Northern: Chiangmai, Pong, Phu Langka, elev. 1300 m., on twig of tall tree in evergreen jungle. June 29, 1954. Tem Smitinand 1752.

Rhizogoniaceae

Rhizogonium spiniforme (Hedw.) Bruch Peninsula VII: Nakawn Srithamarat, Khao Luang, elev. 600 m., on rocks and tree trunks in evergreen forest. Aug. 5, 1951. Tem Smitinand 885. (Flora of Thailand 5772). Det. P. Arens.

Bartramiaceae

Bartramidula bartramoides (Griff.) Wijk & Marg. Central: Saraburi, Nam Tok, Sam Lan, elev. 30 m. Nov. 14, 1964. R. Suvarnasara 72.

Orthotrichaceae

Macromitrium orthostichum Nees Peninsula: Nakawn Srithamarat, Khao Luang, on rhizome of epiphytic fern, in evergreen forest, elev. 600 m. Nov. 5, 1951. Tem Smitinand 1033.

Rhacopilaceae

Rhacopilum schmidii (C.Müll.) Jaeg. Northeast: Loei, Phu Krading, Sam Khae, elev. 1000 m., on tree trunk in evergreen forest. Oct. 1, 1954. Tem Smitinand 2000. (Flora of Thailand 12224). Det. by E.B.Bartram.

Hedwigiaceae

Cleistostoma ambigua (Hook.) Brid. Northwest: Chiangmai, Chiangdao, north slope, elev. 1900 m., common on rocks on the ridge. Feb. 17, 1958. Tem Smitinand 4226. (Flora of Thailand 22686). Det. by E.B.Bartram.

Trachypodaceae

Trachypodopsis serrulata (P.Beauv.) Fleisch. Northern: Chiangmai, Chiangdao, north slope, elev. 1900 m., common on rocks. Feb. 17, 1958. Tem Smitinand 4229. (Flora of Thailand 16695) Det. by E.B.Bartram as T. crispulata (Hook.) Fleisch.

Pterobryaceae

Calyptothecium wightii (Mitt.) Fleisch. Southeast: Trat, Huay Raeng, elev. 50 m., on base of Mangifera indica root, in village. July 27, 1952. Tem Smitinand 1452.

Pterobryopsis nematosum (C.Müll.) Dix. (Calyptothecium nematosum (C.Müll.) Fleisch.). Peninsula: Nakawn Srithamarat, Khiriwong, elev. 100 m., on tree trunk in plantation. Apr. 15, 1952. Tem Smitinand 1291. (Flora of Thailand 7791).

Meteoriaceae

Meteoropsis ancistrodes (Ren. et Card.) Broth. Northwest: Chiang Dao, above "Hill Station", elev. 4500 ft., on tree trunk in montane forest. Dec. 6, 1957. P.W.Richards 5482. Det. by Richards & Giesy as M. squarrosa (Hook.) Fleisch.

Papillaria formosana Nog., var. pilifera Nog. Northwest: Chiangmai, Chiangdao, north slope, elev. 1800 m., pendulous on trees in evergreen forest. Feb. 17, 1958. Tem Smitinand 4230. (Flora of Thailand 16094). Det. by E.B.Bartram as P. auriculata var. gracilis Bartr., var. nov.

Neckeraceae

Homaliodendron microdendron (Mont.) Fleisch. Northeast: Loei, Phu Krading, Sam Khae, elev. 1100 m., on rocks and bases of tree trunks in evergreen jungle. Mar. 30, 1952. Tem Smitinand 1254. (Flora of Thailand 6625). Det. by P. Arens.

Hookeriaceae

Chaetomitropsis glaucocarpa (Reinw.) Fleisch. Northeast: Phu Krading, elev. 1300 m., on small shrub in hill evergreen forest. Mar. 8, 1952. Tem Smitinand 1097. Det. P. Arens; Southeast: Chaburi, Pong Nam Rawn, Khao Kadak, elev. 500 m., on logs and rocks by stream in evergreen jungle. May 1, 1956. Tem Smitinand 3342.

Leskeaceae

Claopodium assurgens (Sull. & Lesq.) Card. Northeast: Loei, Phu Krading, Dawn Pawai, elev. 1300 m., creeping on bark of tree in hill evergreen forest. Mar. 8, 1952. Tem Smitinand 1099. (Flora of Thailand 6647). Det. P. Arens.

Thuidium cymbifolium (Doz. et Molk.) Bry. Jav. Northeast: Loei, Phu Krading, Sam Khae, elev. 1100 m., on rock in dry hill evergreen forest. Mar. 6, 1952. Tem Smitinand 1069. (Flora of Thailand 6641). Det. by P. Arens.

Thuidium glaucinum (Mitt.) Jaeg. Northern: Chiangmai, Pong, Phu Langka, elev. 1300 m., on tree trunk in evergreen jungle. June 29, 1954. Tem Smitinand 1753 and 1751.

Brachytheciaceae

Rhynchostegium celebicum (Lac.) Jaeg. Northeast: Loei, Phu Krading, Sam Khae, elev. 1100 m., on rocks in evergreen forest. Mar. 30, 1952. Tem Smitinand 1253. (Flora of Thailand 6624). Det. P. Arens

Sematophyllaceae

Acroporium baviense (Bosch.) Broth. Northeast: Loei, Phu Krading, Thamsaw, elev. 1300 m., on bark of trees in oak forest. Mar. 10, 1952. Tem Smitinand 1114. (Flora of Thailand 6635). Det. by Sainsbury as A. brevipes (Broth.) Broth. These specimens have the characters given for A. brevipes of the Philippines by Bartram (1928). On the basis of description, the previously named A. baviense of Tonkin is apparently the same species.

Acroporium stramineum (Reinw. et Hornsch.) Fleisch. Central: Khao Khio, Rachasima, elev. 1400 m., on twigs in evergreen forest. Nov. 11, 1963. Tem Smitinand 8420.

Chionostomum angustifolium Dix. Central: Khao Yai Nak-hawn, Rachasima, elev. 1400 m. Nov. 11, 1963. Tem Smitinand 8416. Previously known only from the type locality in Laos (Dixon, 1936).

Sematophyllum caespitosum (Hedw.) Mitt. Southeast: Chaburi, Pong Nam Rawn, Pratrang, elev. 600 m., on rocks in stream. Jan. 21, 1956. Tem Smitinand 3195. (Flora of Thailand 14806). Det. E.B.Bartram.

Sematophyllum microcladium (Doz. et Molk.) Broth. Northern: Chiangmai, Doi Sutep, Pui, elev. 1200 m., on tree in open hill forest. Mar. 21, 1951. Tem Smitinand 160. (Flora of Thailand 6194). Det. G.O.K.Sainsbury.

Taxithelium batanense Bartr. (?) Peninsula: Srithamarat, Khao Luang, elev. 800 m., on shrub stem in hill evergreen forest. Apr. 20, 1952. Tem Smitinand 1293. (Flora of Thailand 7788). Det. by Sainsbury as T. magnum Fleisch.; Southeast: Trat, Huay Raeng, Pak Phreed, elev. under 50 m. June 22, 1952. Tem Smitinand 1422. (Flora of Thailand 7927). Det. by Sainsbury as Isopterygium bancanum (Bry. Jav.) Jaeg.

Taxithelium distratum (Brid.) Broth. Southeast: Trat, Huay Raeng, Dong, Maduea, elev. under 50 m., epiphytic on liana in evergreen forest. June 30, 1952. Tem Smitinand 1351. (Flora of Thailand 6667).

Taxithelium lindbergii (Bosch et Lac.) Ren. et Card. Peninsula: Nakawn Srithamarat, Khao Luang, elev. 600 m., on twig in evergreen forest. Nov. 21, 1951. Phloenchit 149. (Flora of Thailand 5821). Det. by P. Arens as T. clastobryoides Dix.(?).

Trismegistia rigida (H. et R.) Broth. Peninsula: Srithamarat, Khao Luang, terrestrial in mass on rocks and logs in hill evergreen forest, elev. 1000 m. Apr. 20, 1952. Tem Smitinand 1292. (Flora of Thailand 7790). Det. G.O.K.Sainsbury.

Hypnaceae

Ectropothecium cyperoides (Hook.) Jaeg. Peninsula: Nakawn Srithamarat, Khao Luang, elev. 600 m., on log in hill evergreen forest. Nov. 5, 1951. Tem Smitinand 1028. (Flora of Thailand 8423). Det. by Sainsbury as E. siamense Dix.

Ectropothecium intorquatum (Doz. et Molk.) Jaeg. Peninsula: Nakawn Srithamarat, Khao Luang, elev. 1700 m., in earth in evergreen forest. June 26, 1953. Phloenchit 613. (Flora of Thailand 10086).

Ectropothecium monumentorum (Duby) Jaeg. Peninsula: Nakawn Srithamarat, Khao Luang, elev. 1700 m., on decaying log in evergreen forest. July 30, 1953. Phloenchit 656. (Flora of Thailand 10175).

Foreauella orthothecia (Schw.) Dix. et Varde Northeast: Loei, Phu Krading, Sam Khae, elev. 1100 m., on wet log in dry hill evergreen forest. Mar. 6, 1952. Tem Smitinand 1067. (Flora of Thailand 6639). Det. by P. Arens.

Isopterygium minutirameum (C.Müll.) Jaeg. Peninsula: Nakawn Srithamarat, Thapchang, elev. 400 m., on roots of Areca catechu. Dec. 25, 1951. Phloenchit 263. (Flora of Thailand 7786).

Polytrichaceae

Pogonatum gymniophyllum Mitt. Peninsula: Nakawn Srithamarat, Khao Luang, elev. 600 m., on rocks in evergreen forest. Aug. 30, 1952. Phloenchit 411. (Flora of Thailand 8924).

Pogonatum junghuhnianum (Doz. et Molk.) Bosch et Lac. Northwest: Chiangmai, Doi Sutop, elev. 1083 m., on wet ground. Sept. 16, 1957. Khanthachai 683. (Flora of Thailand 15936).

Pogonatum spurio-cirratum Broth. Northeast: Loei, Phu Krading, Dawn Pawai, elev. 1300 m., on wet rocks by stream in hill evergreen forest. Mar. 8, 1952. Tem Smitinand 1102. (Flora of Thailand 6649). Det. by Sainsbury as P. cirratum (Sw.) Brid.; det. by P. Arens as P. macrophyllum Doz. et Molk.; Loei, Phu Krading, Huay Thamyai, elev. 1300 m., common on rocky stream banks in evergreen forest. May 11, 1951. Tem Smitinand 380. (Flora of Thailand 5145). Det. by P. Arens as P. junghuhnianum.

Rhacelopus pilifer Doz. et Molk. Southeast: Chantburi, Makham, Thung Khui, elev. 130 m., moss on ant-hill. Nov. 10, 1954. Bunnak 306. (Flora of Thailand 9519). Det. by E.B. Bartram.

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ADDITIONAL NOTES ON THE GENUS AVICENNIA. III

Harold N. Moldenke

AVICENNIA L.

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AVICENNIA AFRICANA P. Beauv.

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AVICENNIA ALBA Blume

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Rao, Aggarwal, & Mukerjee (1963) report that this species grows on light-gray or bluish-gray soil on Rameswaram Island, India, and that it is often stunted because the pneumatophores are axed by the natives for fuel; it is associated there with Salicornia and Arthocnemum.

AVICENNIA ALBA var. LATIFOLIA Moldenke

Additional bibliography: Moldenke, Phytologia 14: 309 & 310. 1967.

AVICENNIA EUCALYPTIFOLIA Zipp.

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AVICENNIA GERMINANS (L.) L.

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Clarke (1904) reduces Bontia germinans L. to synonymy under Avicennia officinalis L. Robinson & Greenman (1895) refer to A. germinans as "Avicennia tomentosa Linn.", but this homonym is usually placed in the synonymy of A. marina (Forsk.) Vierh.

Additional citations: MEXICO: Tabasco: F. D. Barlow 28/11 (Mi). JAMAICA: Yuncker 17290 (Mi). GALAPAGOS ISLANDS: Charles: J. T. Howell 8841 (Gg—462969). Indefatigable: J. T. Howell 9125 (Gg—463073). James: J. T. Howell 9689 (Gg—462967).

AVICENNIA MARINA (Forsk.) Vierh.

Additional bibliography: Hemming, Proc. Linn. Soc. Lond. 177 (2): 235. 1966; MacNae, Austral. Journ. Bot. 14: 67, 70—78, 84—90, 92—95, 97—100, & 104, pl. 2 & 3. 1966; T. C. Whitmore, Guide Forests Brit. Solomon Isls. 168. 1966; Moldenke, Phytologia 14: 328—335. 1967.

Additional illustrations: MacNae, Austral. Journ. Bot. 14: pl. 2 & 3. 1966.

MacNae (1966) reports that in some parts of Australia this species grows in water of 90 percent salinity and forms extensive copses rarely more than waist high. He also suggests that the height attained by the species depends on the drainage qualities of the soil; specimens on well-drained banks close to streams are taller than those farther away. "Along most stretches of the eastern shores of Queensland where mangrove occur the most seaward zone of the trees is one of Avicennia marina. This zone is seldom more than one or two large trees in depth. In front, thickets of saplings and seedlings extend out on to the beach... Many of the seedlings at these lowest levels have their leaves covered by a layer of fine mud, deposited by the tide, and these seedlings soon die. It is to be suspected that this mud, since it has the same effect as deep shade, is responsible for the death of the saplings....Avicennia saplings die under the shade of their parent trees and can develop to maturity only if fully exposed to the sun. The trees themselves will die when Rhizophora or Bruguiera grow up through and overshadow them."

The flowers are described as "yellow" on Larsen, Smitinand, & Warncke 1220. These collectors found the plant growing in "loamy saline soil".

Additional citations: THAILAND: Larsen, Smitinand, & Warncke 1220 (Ac).

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ADDITIONAL NOTES ON THE GENUS VITEX. III

Harold N. Moldenke

VITEX Tourn.

Additional synonymy: Walrothia Roth ex Bocq., Rev. Verbenac. 181, sphalm. 1863. Tripina Lour. ex Angely, Cat. Estat. Gen. Bot. Fan. 17: 6, sphalm. 1956. Ephi8lis Banks & Soland. ex Angely, Cat. Estat. Gen. Bot. Fan. 17: 6, sphalm. 1956. Agnus Runner, Rep. G. W. Groff Coll. 362. 1961.

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Quisumbing (1960) reports that some species of Vitex known as "molave" in the Philippines [probably V. parviflora A. L. Juss.] are now almost extinct due to the use of their wood in the construction of houses and for making railroad ties. Irvine (1930) lists two unidentified species for which he records the native names "akwakora gyhina" [meaning, "shin bone of old man" because of the jagged protuberances on the trunk when young; when older the bark is longitudinally ridged; found in deciduous forests] and "afetewa" [found in secondary forests, the fruit turning black and edible].

Paijmans (1967) states that Vitex is a common genus of trees in mixed deciduous hill forests and in tall evergreen forests on New Guinea as a canopy tree. He is probably referring to V. cofassus Reinw.

A letter to me from Berta Čerin, dated April 29, 1962, states

that she is working on the chemical constituents of several forms of this genus. S. A. Brown (1963) states that "vitexin, an 8-glycosylapigenin, was discovered and named in this genus in 1898 by Perkin; Bate-Smith (1963) reports finding the same chemical in Crataegus. Hånsel, Leuchert, Rimpler, & Schaaf (1965) examined 5 species of Vitex for the presence of flavonoids, pseudo-indicans (iridoids), volatile oils, and Vitex-triterpene-I. They found that the chemical composition was similar for four species with the striking exception of V. megapotamica. Related species were shown to possess remarkable differences in their secondary products. It seems as if chemical characteristics are more indicative of physiological similarities than of morphological plant relationships. Riley (1963) reports finding chromosome numbers of 24, 26, and 32 in this genus.

Hatusima (1966) reports the genus as rare in lowland thickets. Soukup (1964) reports the vernacular name "taruma". Howard, Wagenknecht, & Green (1963) report that this genus is a specialty in the arboretum at Baghdad, Iraq.

It is worth pointing out that the generic name, Vitex, is accredited to Tournefort also by A. L. Jussieu (1789, 1791). It should also be noted that Angely (1956) misspells the name Ephielis Schreb. as "Sphielis" through a typographic error.

To the list of excluded species should be added:

Vitex orientale King, Weeds of the World 501, sphalm. 1966 =

Viscum orientale Willd., Loranthaceae.

It should be noted that the W. D. J. Koch, Taschenb. Deutsch. Fl., ed. 1, reference cited in the bibliography above is often dated "1844". The Lam (1924) reference is often cited as "1925", but the latter date is merely the titlepage date for the entire volume; the pages cited were published in 1924. Beissner, Schelle, & Zabel, Handb. Laubh. (1903) is often cited as "Schelle, Hand. Deutsch. Dendrol. Ges." Westmann (1744) places Vitex in his group "Plantae baccatae" on page 60 and in his group "Sylva" on page 83 of the work cited. Ascherson (1867) cites a species of Vitex in the Chrysomallum group, but unnamed, collected by Cienkowski "bei Kassen in Fesoghlu, 19 März 1848".

The Buchanan 431, distributed in herbaria as representing a species of Vitex, is actually Schrebera alata (Hochst.) Welw.; Burkart 17052 and Pannier & Schwabe 1189 are members of the Bigoniaceae; and G. Gilbert 2168 is also not verbenaceous.

A suggested key to the species of this genus as found in southwestern Asia is as follows:

1. Inflorescence strictly axillary and cymose, much shorter than the subtending mature petioles. Vitex iraquensis Moldenke (IRAQ).
- 1a. Inflorescence mostly terminal (or axillary only in the uppermost leaf-axils), spicate or paniculate, far surpassing the leaves.
2. Leaflets not more than 3; cymes very lax. Vitex trifolia L.

(AFGHANISTAN).

- 2a. Leaflets usually more than 3; cymes usually dense.
3. Inflorescence mostly in dense simple or paniced spikes; cymes sessile or subsessile; leaflets mostly 5—7.
4. Lower lip of corolla beardless on the inner surface.
5. Leaflets mostly narrow and 9—15 mm. wide, lanceolate or narrow-lanceolate. Vitex agnus-castus L. (IRAQ, IRAN, SIND).
- 5a. Leaflets mostly wider and regularly to 25 mm. wide, mostly oblong-lanceolate. Vitex agnus-castus f. latifolia (Mill.) Rehd. (IRAN).
- 4a. Lower lip of corolla bearded on the inner surface. Vitex agnus-castus var. pseudo-negundo Hausskn. (IRAQ, IRAN, AFGHANISTAN, BALUCHISTAN, SIND).
- 3a. Inflorescence mostly in loose panicles; cymes distinctly stipitate; leaflets usually 3—5. Vitex negundo L. (BALUCHISTAN).

VITEX ACUMINATA R. Br.

Additional bibliography: Warb. in Engl., Bot. Jahrb. 13: 429. 1891; C. A. Gardn., Enum. Pl. Austr. Occid. 3: 112. 1931; Moldenke, Résumé 211 & 474. 1959; Moldenke, Phytologia 8: 62. 1961; Moldenke, Biol. Abstr. 37: 1062. 1962; Hocking, Excerpt. Bot. A.6: 533. 1963; J. S. Beard, Descrip. Cat. W. Austr. Pl. 93. 1965.

Material of this species has been misidentified and distributed in herbaria as V. glabrata R. Br.

Additional citations: AUSTRALIAN REGION: AUSTRALIA: Western Australia: W. V. Fitzgerald 212 (Bi).

VITEX AGLAEIFOLIA Mildbr.

Additional bibliography: Moldenke, Phytologia 5: 160 (1955) and 5: 353. 1956; Moldenke, Résumé 139, 142, & 475. 1959.

VITEX AGLAEIFOLIA var. RUFULA Moldenke

Additional bibliography: Moldenke, Phytologia 5: 161. 1955; Moldenke, Résumé 142 & 475. 1959.

VITEX AGNUS-CASTUS L.

Additional & emended synonymy: Agnus castus vulgaris Carr., Rev. Hort. 42-43: 415. 1871. Vitex agnes-castis L. ex Moldenke, Résumé Suppl. 11: 8, in syn. 1964.

Additional & emended bibliography: Cord., Stirp. Descr., ed. nov., 7. 1541; W. D. J. Koch, Syn. Fl. Germ., ed. 1, 577—578. 1837; W. D. J. Koch, Syn. Deutsch. Fl., ed. 1, 575. 1838; W. D. J. Koch, Taschenb. Deutsch. Fl., ed. 1, 417. 1843; W. D. J. Koch, Syn. Fl. Germ., ed. 2, 2: 663. 1844; W. D. J. Koch, Syn. Deutsch. Fl., ed. 2, 681. 1846; G. & F. Lorinser, Taschenb. Fl. Deutsch., ed. 1, 311 (1847) and ed. 2, 311. 1851; W. D. J. Koch, Taschenb. Deutsch. Fl., ed. 3, 417 (1851) and ed. 4, 399. 1856; Munby, Cat. Pl. Alg. 25. 1859; Bocq., Adansonia 2: 109, 111, 125, 132, 133, &

156 (1862) and 3: 253. 1863; Bocq., Rev. Verbenac. 109, 111, 125, 132, 133, 156, & 253. 1863; Aschers. in G. Schweinf., Beitr. Fl. Aethiop. 278. 1867; Carr., Rev. Hort. 43: 415--416. 1871; E. Hall. in W. D. J. Koch, Taschenb. Deutsch. Fl., ed. 7, 403 (1878) and ed. 8, 403. 1881; Stapf, Denkschr. Akad. Wiss. Wien 50: 93 [Beitr. Fl. Lycien 21]. 1885; J. Ingram, Lang. of Fls. 347 & 355. 1887; Aitch., Journ. Linn. Soc. Lond. Bot. 3: 95. 1888; Beissner, Schelle, & Zabel, Handb. Laubh. 426. 1903; Borm., Beih. Bot. Centralbl. 22 (2): 117--118. 1907; Backer, Ann. Jard. Bot. Buitenz. Suppl. 3: 419. 1910; C. K. Schneid., Ill. Handb. Laubholz. 592--595, fig. 384 o & p, & 385 n--q. 1911; J. Matsumura, Ind. Pl. Jap. 2 (2): 534. 1912; Hickel, Bull. Soc. Dendrol. France 28: 110 & 111, fig. 45f. 1913; Holland, Kew Bull. Addit. Ser. 9 [Useful Pl. Nigeria 3]: 525. 1915; Turrill, Kew Bull. Misc. Inf. 1922: 297 (1922) and 1924: 359. 1924; L. H. Bailey, Man. Cult. Pl., ed. 1, pr. 1, 632 & 849 (1924) and pr. 2, 632 & 849. 1925; Schwencke, Zytol. Untersuch. Verbenac. 7. 1931; Svenson, Brooklyn Bot. Gard. Record 22: 7. 1933; Bider, Beitr. Pharmakog. Borag. 97 & 104--106, pl. 7, fig. 4. 1935; Patermann, Beitr. Zytol. Verbenac. 34--36, 43, & [55], pl. 3, fig. 32--38. 1935; Troncoso, Darwiniana 3: 55. 1937; L. H. Bailey, Man. Cult. Pl., ed. 1, pr. 3, 632 & 849. 1938; Fletcher, Kew Bull. Misc. Inf. 1938: 432. 1938; Rehd., Man. Cult. Trees, ed. 2, 805. 1940; Oppenheimer & Evenari, Bull. Soc. Bot. Genève. 31: 363. 1941; Hottes, Book Shrubs, ed. 4, 403 & 404. 1942; Betts, Jefferson's Gard. Book 333 & 702. 1944; L. H. Bailey, Man. Cult. Pl., ed. 1, pr. 4, 632 & 849. 1944; Le Cointe, Amaz. Bras. III Arv. & Plant. Uteis, ed. 2, 23. 1947; Oppenheimer & Evenari, Florul. Cisiord. 353. 1948; Blakelock, Kew Bull. Misc. Inf. 1949: 539. 1949; L. H. Bailey, Man. Cult. Pl., ed. 2, 843--844 & 1114. 1949; Van Melle, Grower 38: 10. 1951; W. J. Bean in Chittenden, Roy. Hort. Soc. Dict. Gard. 4: 2249. 1951; K. H. Rech., Arkiv Bot., ser. 2, 2: 408. 1952; Gorsch, Fl. URSS 19: 698. 1953; Thorne, Am. Midl. Nat. 52: 313. 1954; Bor & Raizada, Some Beaut. Ind. Climbers [136]. 1954; Darlington & Wylie, Chromosome Atl., pr. 1, 323. 1955; Hocking, Dict. Terms Pharmacog. 124, 166, & 243. 1955; Moldenke in Humbert, Fl. Madag. 174: 77, 78, 80, & 271. 1956; Spector, Handb. Biolog. Data 142. 1956; Moldenke, Biol. Abstr. 30: 1704 (1956) and 32: 1135. 1958; Shinnars, Spring Fl. Dallas 328. 1958; J. & L. Bush-Brown, Am. Gard. Book, new rev. ed., 278. 1958; Bodenheimer, Hist. Biol. 224--225. 1958; Mattoon, Pl. Buyers Guide, ed. 6, 294. 1958; Anon., Kew Bull. Gen. Index 1929-1956, 293. 1959; K. H. Rech., Arkiv Bot., ser. 2, 5: 346. 1959; Kitamura, Fl. Afghan. 327. 1960; T. H. Everett, New Illustr. Encycl. Gard. 13: 2433 & 2434, pl. 13-11c. 1960; Belič, Bergant-Dolar, & Morton, Journ. Chem. Soc. 1961: 2523. 1961; Darlington & Wylie, Chromosome Atl., pr. 2, 323. 1961; Jiménez, List Nom. Vernac. 11. 1961; Moldenke, Phytologia 8: 62. 1961; Belič & Čerin, Vestnik Slovensk. Kemij. Drust. 9: [33]--34. 1962; Sirait, Rimpler, & Hänsel, Experimentia 18: 72. 1962; Nair & Rehman, Bull. Bot. Gard. Lucknow 76: 21. 1962; Moldenke, Biol. Abstr. 37: 1062. 1962; Zohary, Pl. Life Palest. 168 & 217. 1962; Huber in Hutchinson & Dalz., Fl. W. Trop.

Afr., ed. 2, 2: 448. 1963; Bush-Brown, Shrubs & Trees Home Landsc. 161, 197, 206, & 210. 1963; R. C. Mey., Bull. Torrey Bot. Club 89: 404. 1963; Quezel & Santa, Nouv. Fl. Alg. 2: 779 & 780. 1963; Gleason & Cronquist, Man. Vasc. Pl. 582. 1963; Ilina, Spice Aromat. Pl. Sov. Russia 71—72, 376, & 427, fig. 52. 1963; Hänsel & Rimpler, Arch. Pharm. 296: 598. 1963; Sharma & Mukhopadhyay, Journ. Genet. 58: 366, 376, 383, & 539, pl. 11, fig. 31. 1963; Harkness, Phytologia 10: 269. 1964; E. E. Lord, Shrubs & Trees Austr. Gard., rev. ed., 321. 1964; R. L. Taylor, Plants Colon. Days 22 & 106. 1964; Moldenke, Résumé Suppl. 11: 3, 5, & 8 (1964) and 12: 2. 1965; Hänsel, Leuckert, Rimpler, & Schaaf, Phytochem. 4: 19, 21, 23, 24, & 27. 1965; Galil, Ind. Sem. Hort. Bot. Tel-aviv. 1966: 5. 1966; Jiménez, Supl. Cat. Fl. Doming. 1: 275. 1966; Kitamura, Results Kyoto Univ. Scient. Exped. Karakoram 8: 132. 1966; Herbst Bros., Seeds for Nurserymen 18. 1966; T. Swain, Compar. Phytochem. 348. 1966; H. Wagner in T. Swain, Compar. Phytochem. 310. 1966; Prodan & Buia, Fl. Mic. Ilus. Roman. 401. 1966.

Additional illustrations: C. K. Schneid., Ill. Handb. Laubholz. fig. 384 o & p & 385 n—q. 1911; Hickel, Bull. Soc. Dendrol. France 28: 110, fig. 45f. 1913; Bider, Beitr. Pharmakog. Borag. 97, pl. 7, fig. 4. 1935; Patermann, Beitr. Zytol. Verbenac. pl. 3, fig. 32—38. 1935; Hottes, Book Shrubs, ed. 4, 404. 1942; T. H. Everett, New Illustr. Encycl. Gard. 13: 2433 & 2434, pl. 13-11c [in color]. 1960; Sharma & Mukhopadhyay, Journ. Genet. 58: 383, pl. 11, fig. 31. 1963; Ilina, Spice Aromat. Pl. Sov. Russia fig. 52. 1963; R. L. Taylor, Plants Colon. Days 22. 1964.

Cytologists report the haploid chromosome number for this plant as 12. Collectors have found the plant growing in clay loam soil, in ravines, in dried-up wadies, and near water, flowering and fruiting in August. Correll & Hanson found it in a mesquite thicket and as a volunteer in a canal in Texas. Shimmers (1958) reports it wild in Erath County, Texas, while Troncoso (1937) states that it is cultivated in Argentina. Matsumura (1912) records it as cultivated in Japan, Cordus (1541) in Italy, and Turrill (1922) in Turkey. Ilin (1963) reports that it is often cultivated in Russia, that the volatile content of its leaves is 0.36—0.48 percent and in its fruit is 0.74 percent, and that the content of the fruit increases with the development and ripeness of the fruit. Belič, Bergant-Dolar, & Morton (1961) and Sirait, Rimpler, & Hänsel (1962) have isolated the flavone, casticin, from its seeds. Lord (1964) notes that the entire plant is aromatic, is improved by hard pruning in early spring, and is uncommon in Australia, but blooming in Melbourne from January to March.

Rechinger (1952) found Vitex agnus-castus growing at 160—350 meters below sealevel in the Dead Sea area and at 1300 meters above sealevel at Cassius. He cites "D.B8172, D.172f, Comb. 4009, Har. 3097, S.645, and S.2198". The W. D. J. Koch, Taschenb. Deutsch. Fl., ed. 1 (1843) reference cited in the bibliography above, is sometimes misdated "1844".

Quezel & Santa (1963) report that this plant is used medicinally in Algeria and is there known as "bou mettin" and "kef

marium". Jiménez (1961) reports the common names "yerba de la suerte" and "yerba luisa" in the Dominican Republic. Rev. Glenn B. Murdock, in a letter to me dated January 18, 1963, reports that Vitex agnus-castus is called "spikenard" in Florida. The names "lavender flowers" and "blue chaste-tree" are also recorded for it (the latter, however, is more properly applied to var. caerulea Rehd.). Beissner, Schelle, & Zabel (1903) call it the "gemeiner Mönchspfeffer" in Germany. According to Betts (1944) and Taylor (1964) the species is mentioned in Thomas Jefferson's "Garden Book". Schneider (1911) gives V. verticillata Lam. as a synonym, but this name belongs rather to f. latifolia (Mill.) Rehd. Mattoon (1958) lists 20 horticultural sources where it may be purchased. Herbst (1966) refers to it as the "lilac chastetree" and sells 1/4 pound of seed for \$1.35, or \$3.40 per pound.

Spector (1956) describes the plant as 15--20 feet tall, with an 8--13-foot spread and a moderate rate of growth. Nair & Rehman (1962) describe the pollen as subprolate, $31 \times 26 \mu$ (with a range of $28-34 \times 23-28 \mu$), the ectine surface "with a faint L0". They cite Nat. Bot. Gard. 36021, and slide 2693, from Lucknow, India. Ingram (1887) says that in the so-called "language of flowers" it is a symbol of coldness or indifference. Zohary (1962) tells us that it forms part of the Nerion oleandri Alliance in Palestine.

Turrill describes the corollas as "mauve and white". Ayres (1966) describes them as "blue", but is probably referring here to var. caerulea Rehd.

A letter to me from M. Darwish, dated February 10, 1956, informs me of his intention to carry out a pharmacognostic study of this plant for a D.Sc. in biology at the Philadelphia College of Pharmacy and Science, but this intention was apparently not accomplished. Hocking (1955) avers that the aromatic seeds are used as a substitute for pepper, and, by European homeopaths, as a stimulant and carminative and the bark as a stimulant tonic.

Of more than passing interest is the following earliest reference to Vitex agnus-castus known to me. It is a description by Valerius Cordus (1514--1544) of Wittenberg from original observations made on travels in Italy and published in his "Stirpes descriptiones", ed. nov., page 7 (1541), as translated by F. S. Bodenheimer in his "History of Biology" (1958):

"No. 8. On the Chaste-tree (Vitex agnus castus). The Agnus or Vitex is usually called Agnus castus. It is a bushy shrub, growing almost into a slender tree, if it is permitted to grow into adolescence. It divides from a fairly thick trunk into many branches. From the trunk it sends out, from near the root, many shoots, which can be easily torn out and, firmly pressed into soil, readily grow again. The young branches and the new twigs rise at regular intervals opposite to each other, as opposed forking twigs from the knots (of the stalk)...The pedicels arise from a single knot, on both sides, one opposite the other, much shorter than a digit, smooth and tender, from the end of

which come out five, seven or sometimes more leaves, all arising from one common organ like a human palm or like the leaves of hemp: long, narrow and sharp, with a straight and prominent upper longitudinal vein all along the leaf, similar to an olive-leaf; but they are much longer and more tender, greenish above, greyish and moderately woolly underneath. The leaves drop in winter. The biggest and longest leaf is the terminal one, the others being slightly smaller, on both sides, the more they are distant from the biggest one. The last two, sometimes the last one, are very small.

"It flowers in June and July at the forked ends of the long and straight twigs; small, elongate, concave, with the extreme margin longer and intended five times, bringing out small and medium stamens; attached to a small green or greyish cup as in the flowers of lavender or rosemary, and equal, on all sides arranged in a ring around the twiglets in some whirls, forming at intervals a long ear [spike]. Inside the little flowers are blue-purple, outside whitish blue, one each in the indentation of the cup. There grow the seeds which are small, rounded, smaller than pepper, greyish, hard, woody. They remain throughout the winter in the forks. They germinate and sprout late. The bark of these twigs is soft, flexible and not easily broken, just as is the nature of the young twiglets. Leaves, flowers, seed and bark have a heavy smell which oppresses the head. The taste of these parts is slightly bitter and sharp, delicate only in the less active bark than in the other parts. The leaves and the seeds have a stronger taste than the flowers. Hence, the sharpness of the leaves and of the unopened flowers cleaves long to the palate when tasted.

"It grows in wild fields and along the sea, not far from inundations and rapidly flowing rivers. Most common are they in the county of Ancona. It is sown in various gardens in Italy, as at Venice, Travisi, Ferrara, Padua and Bologna."

Additional citations: TEXAS: Aransas Co.: Uzzell 142 (Ar—123394). Bell Co.: Moldenke & Woods 585 (S). Eastland Co.: Moldenke & Woods 596 (S). Henderson Co.: A. R. Moldenke 666 (S). Hill Co.: Moldenke & Woods 569 (S). McLennan Co.: Moldenke & Woods 580 (S). Reeves Co.: Correll & Hanson 29838 (Ld). San Patricio Co.: F. B. Jones 3385 (Ww). Travis Co.: Ripperton 13 (Ar—306605). ARIZONA: Navajo Co.: Rhoton 300 (S). HISPANIOLA: Dominican Republic: B. Augusto 816 (N). ITALY: C. Bicknell s.n. [Siguria, 8.X.1910] (Hi—195093). CORSICA: Lippert 725 (B). JUGOSLAVIA: Ischia: Sarfatti s.n. [24 Luglio 1956] (Hi—192430). Istria: Starbäck J.127 (S). IRAN: Bunge 1 (W—71641). CULTIVATED: Arizona: A. R. Moldenke 151 (Fg). California: Mallory s.n. [Aug. 15, 1919] (Du—103011). Egypt: Degener & Degener 29590 (Ac). Florida: G. E. Murdock s.n. [Daytona Beach, December 15, 1962] (S). Kansas: V. C. Hubbard s.n. [Manhattan, Sept. 1927] (Lb—27630). New Jersey: H. N. Moldenke 22532 (Ac). New Mexico: D. B. Dunn

7911 (Lb—38347), 8382 (Lb—38353). North Carolina: M. T. Cameron s.n. [July 8, 1933] (Hi—59472); P. O. Schallert s.n. [7/1/31] (Du—354754), s.n. [7/1/36] (Hi—59471). Oklahoma: Gephardt 608 (W—2421177). Peru: Soukup 2930 (W—1564064). Texas: Moldenke & Woods 571 (S); Purvis 8 (Ld).

VITEX AGNUS-CASTUS f. ALBA (West.) Rehd.

Additional & emended synonymy: Agnus castus vulgaris alba Carr., Rev. Hort. 42-43: 415. 1871. Agnus castus vulgaris var. alba Carr. ex C. K. Schneid., Ill. Handb. Laubholz. 594, in syn. 1911. Vitex agnuscastus alba Mattoon, Pl. Buyers Guide, ed. 6, 294. 1958. Vitex agnus-castus "Alba" Harkness, Phytologia 10: 269. 1964.

Additional bibliography: C. K. Schneid., Ill. Handb. Laubholz. 594. 1911; L. H. Bailey, Man. Cult. Pl., ed. 2, 844 & 1114. 1949; W. J. Bean in Chittenden, Roy. Hort. Soc. Dict. Gard. 4: 2249. 1951; Mattoon, Pl. Buyers Guide, ed. 6, 294. 1958; Moldenke, Phytologia 8: 26. 1961; Harkness, Phytologia 10: 269. 1964; Moldenke, Résumé Suppl. 11: 8. 1964; Aul, N. Y. Herald Trib. Home & Gard. Sect. 2, April 3. 1966; Wayside Gardens, [Cat.] 1967: 179. 1967.

Additional illustrations: Aul, N. Y. Herald Trib. Home & Gard. Sect. 2, April 3. 1966; Wayside Gardens, [Cat.] 1967: 179 [in color]. 1967.

Aul (1966) reports this plant as offered by Wayside Gardens under the name "Silver Spire". He describes this horticultural variety as "a pure [white] form of Vitex macrophylla in contrast to the cream to lavender whites that have been offered in the past. It has the same distinctive appearance and growth habits as the regular macrophylla but is somewhat smaller in size. The plant is covered with long pointed flower spikes of purest white from July until severe frost, a time when good shrub bloom is virtually non-existent. This should be a most welcome addition to the summer blooming shrubs." Mattoon (1958) lists only one source for the form. It is possible that Silver Spire, being a form of V. agnus-castus f. latifolia (Mill.) Rehd., should not be included in V. agnus-castus f. alba (West.) Rehd., which is a white form of the typical form of the species. Carriere's original description is "Aspect et vigueur à peu près semblables à ceux du type, dont il diffère par ses fleurs blanches".

Additional citations: TEXAS: Ellis Co.: Moldenke & Woods 572 (S).

VITEX AGNUS-CASTUS var. CAERULEA Rehd.

Additional synonymy: Vitex agnus castus coerulea Hort. ex Beissner, Schelle, & Zabel, Handb. Laubh. 426, nom. nud. 1903. Vitex agnus castus var. coerulea Rehd. ex C. K. Schneid., Ill. Handb. Laubholz. 594. 1911.

Additional bibliography: C. K. Schneid., Ill. Handb. Laubholz. 594. 1911; Moldenke, Phytologia 8: 27. 1961; Ayres, Flow. Shrubs

Year-round Color 32. 1966.

Ayres (1966) refers to this taxon, without mentioning a varietal name, as "blue chaste-tree" and reports that it grows 6--10 feet tall, bearing blue flowers in summer, and can withstand temperatures as low as 20° F.

Additional citations: CULTIVATED: North Carolina: P. O. Schallert 351 (Hi--30276).

VITEX AGNUS-CASTUS var. DIVERSIFOLIA (Carr.) Schelle in Beissner, Schelle, & Zabel, Handb. Laubh. 426 [as "V. agnus castus diversifolia"]. 1903.

Synonymy: Vitex latiore serrato folio L'Obel, Pl. Stirp. Icon. 2: 139. 1581. Agnus folio serrato J. Bauhin, Hist. Pl. Univers. 1 (6): 205. 1650. Vitex latiore folia J. Bauhin, Pinax Theatr. Bot. 475. 1671. Agnus castus vulgaris diversifolia Carr., Rev. Hort. 42--43: 415. 1871. Agnus castus vulgaris var. diversifolia Carr. apud C. K. Schneid., Ill. Handb. Laubholzsk. 594, in syn. 1911. Vitex agnus-castus var. serrata Moldenke, Geogr. Distrib. Avicenn. 40, nom. nud. (1939); Am. Midl. Nat. 24: 753. 1940.

Additional bibliography: [in addition to the references given previously under V. agnus-castus var. serrata Moldenke] Carr., Rev. Hort. 42-43: 415. 1871; Beissner, Schelle, & Zabel, Handb. Laubh. 426. 1903; C. K. Schneid., Ill. Handb. Laubholzsk. 594. 1911; Moldenke, Phytologia 8: 27. 1961.

It appears that the taxon which I called V. agnus-castus var. serrata in my monograph must have its name changed to V. agnus-castus var. diversifolia, as indicated by the synonymy listed above. Schneider's description of it is "einige B'chen gezähnt".

The Beissner, Schell, & Zabel, Handb. Laubh. (1903) publication is cited by Schneider (1911) as "Schelle, H.d.D.G.", while Carrière's publication is often dated "1870-1871" or cited as volume "42" or "43" -- actually it is a combination of the two volumes in one and the page in question was published in 1871. His original description of the plant is "Se distingue du précédent [Agnus castus vulgaris] par ses folioles, les unes entières, les autres dentées; ses inflorescences aussi sont plus effilées, et ses fleurs sont violet rosé lilacé".

VITEX AGNUS-CASTUS f. LATIFOLIA (Mill.) Rehd.

Additional & emended synonymy: Agnus castus robusta Carr., Rev. Hort. 42-43: 416. 1871. Vitex agnus castus robusta Schelle in Beissner, Schelle, & Zabel, Handb. Laubh. 426, nom. nud. 1903. Vitex angnus-castus f. latifolia (Mill.) Rehd. ex Lombardo, Invent. Pl. Cult. Montevide. 235, sphalm. 1954. Vitex negundo macrophylla Mattoon, Pl. Buyers Guide, ed. 6, 294. 1958. Vitex agnuscastus latifolia Mattoon, Pl. Buyers Guide, ed. 6, 294. 1958. Vitex agnuscastus macrophylla Mattoon, Pl. Buyers Guide, ed. 6, 294, in syn. 1958. Vitex agnuscastus f. latifolia (Mill.) Rehd.

ex Lombardo, Arbust. & Arbustil. Pas. Publ. 43. 1961.

Additional & emended bibliography: Carr., Rev. Hort. 42-43: 416. 1871; C. K. Schneid., Ill. Handb. Laubholz. 594. 1911; Svenson, Brooklyn Bot. Gard. Record 22: 7. 1933; Lombardo, Invent. Pl. Cult. Montevid. 235. 1954; Moldenke in Humbert, Fl. Madag. 174: 77. 1956; Mattoon, Pl. Buyers Guide, ed. 6, 294. 1958; Anon., Kew Bull. Gen. Index 1929-1956, 293. 1959; Moldenke, Phytologia 8: 26. 1961; Lombardo, Arbust. & Arbustil. Pas. Publ. 43, 242, & 314. 1961; Belič & Čerin, Vestnik Slovensk. Kemij. Drust. 9: 33. 1962; Harkness, Phytologia 10: 269. 1964; Aul, N. Y. Herald Trib. Home & Gard. Sect. 2, April 3. 1966; Wayside Gardens, [Cat.] 1967: 179. 1967.

Additional illustrations: Wayside Gardens, [Cat.] 1967: 179 [in color]. 1967.

This plant has been collected in moist soil of pastures. Mattoon (1958) lists at least 33 horticultural sources for this plant. Belič & Čerin (1962) report that the flavone, casticin, is found in its seeds.

Carrière's original description of his variety robusta is as follows: "Arbrisseau très vigoureux, pouvant même former un petit arbre. Feuilles relativement grandes, à foliolis gris verdâtre, tomenteuses-feutrées, assez larges, entières. Inflorescence spiciforme, étroite, atteignant jusqu'à 50 centrimètres de longueur, peu ramifiée (deux courtes ramilles florifères) à sa base, garnie dans toute sa longueur de fleurs rose carné, relativement très-grandes (les plus grandes du genre). Très-belle plante."

Aul (1966) describes a pure white-flowered form, called "Silver Spire" horticulturally and offered to the trade by Wayside Gardens. Tentatively I am placing this in f. alba (West.) Rehd., but if it is really a form of f. latifolia rather than of typical V. agnus-castus, as appears from the description, it may need a new designation. He notes that its corollas are pure-white "in contrast to the cream to lavender whites that have been offered in the past". Wayside Gardens offer it at \$4.50 each, three for \$12.50, and \$45 per dozen.

Material of V. agnus-castus f. latifolia has been misidentified and distributed in herbaria as typical V. agnus-castus L.

Additional citations: SOUTH CAROLINA: Darlington Co.: B. E. Smith 1468 (Hi--26017). GEORGIA: Bibb Co.: A. R. Moldenke 372 (Fg). LOUISIANA: Orleans Par.: Ewan 18258 (Ac). CULTIVATED: California: McClintock s.n. [July 14, 1943] (Mi). North Carolina: LeClair s.n. [July 26, 1937] (Hi--8503).

VITEX AGNUS-CASTUS var. PSEUDO-NEGUNDO Hausskn. in Borrm., Beih. Bot. Centralbl. 22 (2) [Pl. Strauss. 3]: 117--118. 1907.

Additional & emended bibliography: Borrm., Beih. Bot. Centralbl. 22 (2) [Pl. Strauss. 3]: 117--118. 1907; Blakelock, Kew Bull. Misc. Inf. 1949: 539. 1949; Galil, Hort. Bot. Univ. Tel-aviv. Ind. Sem. 1964: 6 (1964) and 1966: 5. 1966; Kitamura, Results Kyoto Univ.

Scient. Exped. Karakoram 8: 132. 1966; Galil, Tankus, & Prusbul, Hort. Bot. Univ. Tel-aviv. Ind. Sem. 1967: 7. 1967.

A letter from Dr. Simone Vautier, dated August 27, 1964, enables me to correct the citation for the original publication of the trinomial accepted for this taxon. She says "A la page 193, à propos du Vitex agnus-castus var. pseudo-negundo (Hausskn.) in Borm. vous indiquez que la référence exacte, citée par Hand.-Maz [sic] vous manque: Plantae Strauss. 3: 117 (1907). La citation indiquée se trouve en effet dans un article de Bormüller J. dont le titre est 'Plantae Straussianae' pars 3, paru dans les Beihefte z. Centralblatt 1907 Band 22/2, pages 102 à 142. Il est probable que depuis 1955, vous avez mis la main sur ce détail de la littérature des Vitex, cependant, je me permets à tout hasard de vous le signaler, si cela peut vous être utile."

Regel reports that this plant is very common on the banks of the rivers running from the mountains of Iraq. It is "very close to the Mediterranean Vitex agnus castus and can be considered as an Irano-Turanian variety of the Mediterranean element". A letter to me from Berta Čerin, dated April 29, 1962, announces her intention to work on the chemical constituents of the seeds of this variety. Its corollas are described as "blue" on the Gillett s.n. and as "violet" on the Rami s.n. specimens cited below. Blakelock (1949) cites Lazar 1593 from Iraq.

Additional citations: IRAQ: Gillett s.n. [Nat. Herb. Iraq 9432] (W--2274217); Rami s.n. [Nat. Herb. Iraq 9070] (W--2272901); C. Regel 66 (B).

VITEX AGNUS-CASTUS var. PSEUDO-NEGUNDO f. ALBIFLORA Moldenke

Additional bibliography: Moldenke, Phytologia 5: 195. 1955; Moldenke, Résumé 158 & 475. 1959.

Personally, I do not like the use of trinomials and quadrinomials, but their use seems to be standard practice today.

VITEX AGNUS-CASTUS var. SERRATA Moldenke

It appears that the correct name for this taxon is V. agnus-castus var. diversifolia (Carr.) Schelle, which see.

VITEX AGNUS-CASTUS f. VARIEGATA Moldenke, f. nov.

Synonymy: Vitex agnus castus variegata Hort. ex Beissner, Schelle, & Zabel, Handb. Laubh. 426, nom. nud. 1903.

Haec forma a forma typica speciei foliolis albo-variegatis recedit.

This form differs from the typical form of the species in having its leaflets variegated with whitish patches.

VITEX ALTISSIMA L. f.

Additional & emended synonymy: Vitex altissima L. ex Moldenke, Phytologia 5: 197, in syn. 1955; Satyanarayan, Proc. Sympos. Humid Trop. Veg. 205. 1958. Vitex altissima L. ex Nair & Rehman, Bull. Bot. Gard. Lucknow 76: 21, fig. 24, sphalm. 1962.

Additional bibliography: Bocq., *Adansonia* 3: [Rev. Verbenac.] 253. 1863; W. A. Talbot, *Syst. List Trees Shrubs Bomb.* 161, 162, & 229. 1894; E. D. Merr., *Interpret. Rumph. Herb. Amboin.* 310 & 594. 1917; Gamble, *Fl. Madras* 1101--1103. 1924; Dastur, *Useful Pl. India* 221. 1952; Moldenke in Humbert, *Fl. Madag.* 174: 77. 1956; Satyanarayan, *Proc. Sympos. Humid Trop. Veg.* 205. 1958; Nayar, *Bull. Bot. Surv. India* 1: 124. 1959; Maun, *Philip. Journ. Forest.* 16: 108. 1960; Sebastine & Henry, *Bull. Bot. Surv. India* 3: 61, 1961; Moldenke, *Phytologia* 8: 62. 1961; Nair & Rehman, *Bull. Bot. Gard. Lucknow* 76: 21, fig. 24. 1962; Menninger, *Flow. Trees World* 285. 1962; Legris, *Trav. Sect. Scient. Inst. Franç. Pond.* 6: 184, 193--195, 202, 263, 501, 508, 522, & 586. 1963; Meher-Homji, *Trav. Sect. Scient. Inst. Franç. Pond.* 7 (1): 163. 1963; A. L. Moldenke, *Phytologia* 11: 70. 1964; Rao & Sastry, *Bull. Bot. Surv. India* 6: 160 & 164. 1964; Backer & Bakh., *Fl. Java* 2: 606. 1965; D. S. Rao, *Naturwiss.* 52 (10): 262. 1965; Qureshi, *Govt. Sarawak Sympos. Ecol. Res. Humid Trop. Veg.* 127 & 128. 1965; Annon., *Biol. Abstr.* 47: 2888. 1966.

Additional illustrations: Nair & Rehman, *Bull. Bot. Gard. Lucknow* 76: 21, fig. 24. 1962.

Nair & Rehman (1962) describe the pollen of this plant as subprolate, $28 \times 21 \mu$ (with a range of $26-28 \times 21-22 \mu$), the ectine surface faintly areolate. Rao & Sastry (1964) report the species as common in Mysore, India. Backer & Bakhuizen van den Brink (1965) assert that immature trees of *V. pinnata* L. are often mistaken for and identified as *V. altissima* in error. Dastur (1952) actually regards the name, *Vitex pinnata* L., as a synonym of *V. altissima*, but I have examined the actual type specimen, as I have stated previously, and it is certainly identical with what used to be called *V. pubescens* Vahl. Dastur states that *V. altissima* is known as "bulgi", "burnige", "milla", and "naviladi" in India, that its drupes are 1/4 inch in diameter, purple, white-dotted, and borne on a persistent calyx, and that it is common in the Western Ghats in southern India where it is used for building Hindu temples. Its wood is olive-gray to olive-brown, durable under water, takes a good polish, and is excellent timber for furniture, cabinet-work, turnery, building and well construction, carts, the felloes of wheels, agricultural implements, and combs. A yellow dye is extracted from the wood.

The Ramaswamy 2897 distributed as *V. altissima* is actually *V. negundo* L.

VITEX ALTISSIMA var. *ZEYLANICA* (Turcz.) C. B. Clarke

Additional bibliography: Moldenke, *Phytologia* 5: 202--203. 1955; Moldenke, *Résumé* 167, 225, 380, 391, & 475. 1959.

Turczaninow's original description of this taxon is "V. caule ramisque tetragonis glabriusculis; foliis oppositis longe petiolatis, foliolis ternis breviter petiolulatis, oblongo-lanceolatis utrinque attenuatis integerrimis, utraque pagina punctis minutissimis exasperata, caeterum subglabris subtus pallidioribus; paniculis terminalibus geminis trichotomis pubescentibus, foliis multo

longioribus; cymis in ramis paniculae oppositis confertis; calycibus brevissime pedicellatis, obtuse 5 dentatis, corolla infundibuliformi subduplo brevioribus. Zeylan, Gardner No 674."

Additional citations: CEYLON: J. Fraser 178 (W—71640).

VITEX AMBONIENSIS Gürke

Additional bibliography: K. Schum. in Just, Bot. Jahresber. 28 (1): 497. 1902; Moldenke, Phytologia 8: 28—29. 1961; Moldenke, Résumé Suppl. 12: 7. 1965.

Recent collectors describe this plant as a bush or shrub, 8 feet tall, a tree to 30 feet tall, or even as a "liana with long spreading branches covering a big area", the branches slender, bark dark-gray, roughened, with a brown slash, leaf-blades greenish, with a yellowish-brown tomentum, and the fruit green, mottled. The corollas are described as "yellowish, with a large blue lobe and blue hairs in the throat" (R. M. Harley 9424), "purple" (H. G. Faulkner 1853), or "upper petals blue-mauve, lower paler, throat yellow" (Wild, Goldsmith, & Muller s.n.). The plant has been found in flower in April and August, growing at altitudes of 10 to 2550 feet in the coastal bush or on recently burned savannas with scattered small bushes and trees. It is said to be "moderately common" in Tanganyika.

Additional citations: TANGANYIKA: H. G. Faulkner 1853 (S); R. M. Harley 9424 (S). KENYA: Edmund Heller 314 (W—634397). ANGOLA: Benguela: Campos de Andrada 74 (UL). RHODESIA: B. Goldsmith 79/62 (S); Wild, Goldsmith, & Muller s.n. [4.12.1964] (S).

VITEX AMBONIENSIS var. SCHLECHTERI Pieper

Additional bibliography: Moldenke, Phytologia 5: 206. 1955; Moldenke, Résumé 151 & 475. 1959.

VITEX ANDONGENSIS J. G. Baker

Additional bibliography: K. Schum. in Just, Bot. Jahresber. 28 (1): 497. 1902; Moldenke, Phytologia 5: 206. 1955; Moldenke, Résumé 147, 381, & 475. 1959.

VITEX ANGOLENSIS Gürke

Additional bibliography: Gürke in Baum, Kunene-Sambesi Exped. 350. 1903; Moldenke, Phytologia 5: 207 (1955) and 5: 355. 1956; Moldenke, Résumé 147 & 475. 1959.

VITEX APPUNI Moldenke

Additional bibliography: Moldenke, Phytologia 5: 207—208. 1955; Moldenke, Résumé 76, 111, & 475. 1959.

Aristeguieta describes this plant as a tree, 6--8 m. tall, with blue flowers, blooming in February. Material has been misidentified and distributed in herbaria under the name V. orinocensis (Miq.) Huber.

Additional citations: VENEZUELA: Guárico: Aristeguieta 4527 (N).

VITEX AUREA Moldenke

Additional bibliography: Moldenke, *Phytologia* 5: 208--209. 1955; Moldenke in Humbert, *Fl. Madag.* 174: 74, 103, 105, & 271, fig. 15, 1. 1956; Moldenke, *Résumé* 156 & 475. 1959.

Illustrations: Moldenke in Humbert, *Fl. Madag.* 174: 105, fig. 15, 1. 1956.

VITEX AXILLARIS Wall.

Additional bibliography: Moldenke, *Phytologia* 5: 209. 1955; Moldenke, *Résumé* 166 & 475. 1959.

VITEX BALBI Chiov.

Additional bibliography: Moldenke, *Phytologia* 5: 209. 1955; Moldenke, *Résumé* 146 & 475. 1959.

VITEX BARBATA Planch.

Additional bibliography: Dalz., *Useful Pl. W. Trop. Afr.* 456. 1937; Moldenke, *Résumé* 133, 135--137, 140, & 475. 1959; Moldenke, *Phytologia* 8: 62. 1961; F. R. Irvine, *Woody Pl. Ghana* 761. 1961.

Irvine (1961) describes this plant as a tree, the young parts finely golden-pubescent, the leaves digitate, with 3--5 leaflets, the central one largest, 5 inches long, 2 inches wide, crenulate toward the apex, cuneate at the base, the flowers small, hairy, yellowish and blue-purple, in long-peduncled cymes that are minutely tomentellous, collected in flower from February to April, in fruit in April, growing in the savanna forest from Senegambia to Ghana. He cites Kitson 835. Dalziel (1937) says that in Gambia it is called "kutu-fingo" and in French Guinea the vernacular names are "as for V. chrysocarpa", including "ba-kudu-né".

VITEX BEFOTAKENSIS Moldenke

Additional bibliography: Moldenke, *Phytologia* 5: 209--210. 1955; Moldenke in Humbert, *Fl. Madag.* 174: 75, 118--119, 121, & 272, fig. 18, 1 & 2. 1956; Moldenke, *Résumé* 157 & 475. 1959.

Illustrations: Moldenke in Humbert, *Fl. Madag.* 174: 121, fig. 18, 1 & 2. 1956.

VITEX BENTHAMIANA Domin

Additional bibliography: Warb. in Engl., *Bot. Jahrb.* 13: 428. 1891; Moldenke, *Phytologia* 8: 29. 1961.

VITEX BENUENSIS Engl.

Additional bibliography: Moldenke, *Phytologia* 5: 211. 1955; Moldenke, *Résumé* 139 & 475. 1959.

VITEX BEQUAERTI DeWild.

Additional bibliography: Moldenke, *Phytologia* 5: 355. 1956; Moldenke, *Résumé* 142 & 475. 1959.

VITEX BERAIVIENSIS Vatke

Synonymy: Vitex bevariensis Vatke ex Moldenke in Humbert, *Fl.*

Madag. 174: 95, sphalm. 1956.

Additional bibliography: Moldenke, *Phytologia* 5: 211—213.

1955; Moldenke in Humbert, *Fl. Madag.* 174: 72, 73, 95—99, & 272, fig. 13, 2—4. 1956; Moldenke, *Résumé* 157, 381, 384, & 475. 1959.

Illustrations: Moldenke in Humbert, *Fl. Madag.* 174: 95, fig. 13, 2—4. 1956.

VITEX BERAIVIENSIS var. ACUMINATA Moldenke

Additional bibliography: Moldenke, *Phytologia* 5: 213. 1955; Moldenke in Humbert, *Fl. Madag.* 174: 73, 95, 98—99, & 272, fig. 13, 7. 1956; Moldenke, *Résumé* 157, 381, 384, & 475. 1959.

Illustrations: Moldenke in Humbert, *Fl. Madag.* 174: 95, fig. 13, 7. 1956.

VITEX BERAIVIENSIS f. PILOSA Moldenke

Synonymy: *Vitex beraviensis* var. pilosa Moldenke in Humbert, *Fl. Madag.* 174: 95, sphalm. 1956.

Additional bibliography: Moldenke, *Phytologia* 5: 213—214. 1955; Moldenke in Humbert, *Fl. Madag.* 174: 72, 95, 97, 98, & 272, fig. 13, 5. 1956; Moldenke, *Résumé* 157 & 475. 1959.

Illustrations: Moldenke in Humbert, *Fl. Madag.* 174: 95, fig. 13, 5. 1956.

VITEX BERAIVIENSIS f. VILLOSA Moldenke

Synonymy: *Vitex beraviensis* var. villosa Moldenke in Humbert, *Fl. Madag.* 174: 95, sphalm. 1956.

Additional bibliography: Moldenke, *Phytologia* 5: 214. 1955; Moldenke in Humbert, *Fl. Madag.* 174: 73, 95, 98, & 272, fig. 13, 6. 1956; Moldenke, *Résumé* 157 & 475. 1959.

Illustrations: Moldenke in Humbert, *Fl. Madag.* 174: 95, fig. 13, 6. 1956.

VITEX BETSILIENSIS Humbert

Bibliography: Humbert, *Not. Syst.* 8: 22. 1939; Moldenke, *Phytologia* 5: 214—215. 1955; Moldenke in Humbert, *Fl. Madag.* 174: 73, 74, 100—102, & 272, fig. 14, 6 & 7. 1956; Moldenke, *Résumé* 157, 225, & 475. 1959.

Illustrations: Moldenke in Humbert, *Fl. Madag.* 174: 101, fig. 14, 6 & 7. 1956.

VITEX BETSILIENSIS ssp. BARORUM Humbert

Bibliography: Humbert, *Not. Syst.* 8: 23—24. 1939; Moldenke, *Phytologia* 5: 215. 1955; Moldenke in Humbert, *Fl. Madag.* 174: 74, 101, 102, & 272, fig. 14, 3 & 9. 1956; Moldenke, *Résumé* 157 & 475. 1959.

Illustrations: Moldenke in Humbert, *Fl. Madag.* 174: 101, fig. 14, 8 & 9. 1956.

VITEX BOGALENSIS Wernham

Additional bibliography: Moldenke, *Phytologia* 5: 215. 1955; Moldenke, *Résumé* 139 & 475. 1959.

VITEX BOJERI Schau.

Additional bibliography: Moldenke, *Phytologia* 5: 355--356. 1956; Moldenke in Humbert, *Fl. Madag.* 174: 74, 75, 103--106, & 272, fig. 15, 2 & 3. 1956; Moldenke, *Résumé* 157, 251, 381, 383, & 475. 1959.

Illustrations: Moldenke in Humbert, *Fl. Madag.* 174: 105, fig. 15, 2 & 3. 1956.

VITEX BOJERI var. SUBORBICULARIS Moldenke

Bibliography: Moldenke, *Phytologia* 3: 431 (1951) and 5: 217. 1955; Moldenke in Humbert, *Fl. Madag.* 174: 74, 105, 106, & 272, fig. 15, 4. 1956; Moldenke, *Résumé* 157 & 475. 1959.

Illustrations: Moldenke in Humbert, *Fl. Madag.* 174: 105, fig. 15, 4. 1956.

VITEX BRACTEATA S. Elliot

Additional bibliography: Moldenke, *Phytologia* 5: 217--218. 1955; Moldenke in Humbert, *Fl. Madag.* 174: 75, 119--121, & 272, fig. 18, 3. 1956; Moldenke, *Résumé* 157 & 475. 1959.

Illustrations: Moldenke in Humbert, *Fl. Madag.* 174: 121, fig. 18, 3. 1956.

VITEX BREVILABIATA Ducke

Additional bibliography: Moldenke, *Phytologia* 8: 29. 1961.

An isotype of this species, Ducke s.n. [Herb. Rio de Janeiro 311], in the herbarium at the Botanisches Museum at Berlin, was photographed there by Macbride as his type photograph number 17559, but is now destroyed.

Additional citations: BRAZIL: Pará: Ducke s.n. [Herb. Rio de Janeiro 311; Macbride photos 17559] (N--photo of isotype, W--photo of isotype).

VITEX BREVIPETIOLATA Moldenke

Additional bibliography: Moldenke, *Phytologia* 5: 220. 1955; Moldenke, *Résumé* 111 & 475. 1959.

VITEX BUCHANANII J. G. Baker

Additional bibliography: Moldenke, *Phytologia* 8: 62. 1961.

Best describes this plant as a large herb or shrub with several erect stems from a single rootstock, the stems green, smooth, and rather brittle, "not woody like a shrub", the leaves medium-green above, rough, paler beneath, the flowers white, the anthers pale-brown, and the entire plant faintly aromatic and reminiscent of celery, growing in cleared woodland, in well-drained rocky black soil in full exposure to the sun, at 3250 feet altitude, blooming in February.

Additional citations: RHODESIA: E. B. Best 189 (S).

VITEX BUCHANANII var. QUADRANGULA (Gürke) Pieper

Additional bibliography: K. Schum. in Just, *Bot. Jahresber.* 28 (1): 497. 1902; Moldenke, *Phytologia* 8: 29. 1961.

VITEX BUCHNERI Gürke

Additional bibliography: Moldenke, Phytologia 5: 303 (1955) and 5: 356. 1956; Moldenke, Résumé 142, 147, & 475. 1959.

The two collections cited below were erroneously cited by me in Phytologia 5: 303 (1955) as V. congolensis DeWild. & Th. Dur.; their petiolules seem to be definitely elongate.

Additional citations: CONGO LEOPOLDVILLE: Claessens 675 (N, S); Louis 1761 (N).

VITEX BUDDINGII Moldenke

Bibliography: Moldenke, Phytologia 4: 59—60 (1952) and 5: 222—223. 1955; Moldenke, Résumé 194 & 475. 1959.

VITEX BURMENSIS Moldenke

Bibliography: Moldenke, Phytologia 8: 30—31. 1961; Moldenke, Biol. Abstr. 37: 1062. 1962; Moldenke, Résumé Suppl. 3: 17. 1962.

VITEX CAESPITOSA Exell

Additional bibliography: Moldenke, Phytologia 5: 223. 1955; Moldenke, Résumé 147 & 475. 1959.

VITEX CALOTHYRSA Sandw.

Additional bibliography: Moldenke, Biol. Abstr. 30: 1704. 1956; Anon., Kew Bull. Gen. Index 1929—1956, 293. 1959; Moldenke, Phytologia 8: 31. 1961.

An isotype of this species, Spruce 3356, in the herbarium of the Botanisches Museum at Berlin, was photographed there by Macbride as his type photograph number 17564, but is now destroyed.

Additional citations: VENEZUELA: Bolívar: Spruce 3356 [Macbride photos 17564] (W—photo of isotype). BRAZIL: Amazonas: Ducke 505 (W—1693509).

VITEX CANESCENS Kurz

Additional & emended bibliography: Craib, Kew Bull. Misc. Inf. 9: 443. 1911; Fletcher, Kew Bull. Misc. Inf. 1938: 431 & 433—434. 1938; Anon., Kew Bull. Gen. Index 1929—1956, 293. 1959; Moldenke, Phytologia 8: 31—32. 1961; Legris, Trav. Sect. Scient. Inst. Franç. Pond. 6: 508 & 586. 1963.

Recent collectors describe this plant as a tree or small tree, 30 m. tall, "downy in all parts", the trunk 1 1/2 feet in diameter, rather rough, the bark gray, peeling off in irregular patches, the inflorescences to 1 m. long, the corollas cream-white, yellow in the throat (Kingdon-Ward 21882), the fruit black, growing at 2000—3000 m. altitude, blooming in March, fruiting in June and July.

Additional citations: INDIA: Assam: Koelz 28165 (M). BURMA: Upper Burma: Kingdon-Ward 21882 (Bm). THAILAND: Kostermans 1248 (W—2039892).

VITEX CAPITATA Vahl

Additional synonymy: Vitex capitatus Vahl ex Moldenke, Résumé

Suppl. 7: 10, in syn. 1963.

Additional bibliography: Bocq., *Adansonia* 3: [Rev. Verbenac.] 253. 1863; Ettingsh., K. Akad. Wiss. Wien Denkschr. 28: 219 [Fossile Fl. Bilin 2: 21]. 1868; Moldenke in Cheesman, Fl. Trin. & Tob. 2: 411--413. 1955; Moldenke, Verb. 30--32. 1955; Moldenke, Phytologia 8: 32. 1961; Moldenke, Résumé Suppl. 7: 10. 1963.

Recent collectors describe this plant as a tree, 3.5--10 m. tall, the trunk 10 cm. in diameter, the leaves subcoriaceous, deep-green above, pale-green beneath, the buds greenish-white, the immature fruit green, growing along rivers on wooded slopes bordering savannas and on granitic outcrops, at 300--600 m. altitude, fruiting in August, and called "guaratare" or "guatara".

An isotype specimen, Ryan s.n., deposited in the herbarium of the Muséum National d'Histoire Naturelle at Paris, was photographed there by Macbride as his type photograph number 39499. The type of V. bignonoides, Bonpland 741, deposited in the herbarium of the Botanisches Museum at Berlin, was photographed there by Macbride as his type photograph number 17558, but is now destroyed.

Additional citations: TRINIDAD: Ryan s.n. [1796; Herb. Willdenow 11712; Herb. Jussieu 5057; Macbride photos 39499] (W--photo of isotype). VENEZUELA: Anzoategui: H. Pittier 14884 (W--1857801). Apuré: Vélez 2688 (Ve). Aragua: Bonpland 741 [Macbride photos 17558] (W--photo). Bolívar: J. A. Steyermark 86791 (Fg, N), 94269 (Lw). Guárico: Aristeguieta 4183 (Ve--45591); Burkart 16206 (Ve). Monagas: F. D. Smith 230 (W--2121473); Wurdack & Monachino 39451 (N). SURINAM: Irwin, Prance, Söderstrom, & Holmgren 55514 (N).

VITEX CARBUNCULORUM Smith & Ramas

Additional bibliography: Moldenke, Phytologia 5: 264--265. 1955; Moldenke, Résumé 166 & 475. 1959.

Recent collectors have described this species as a tree or tall tree, 7 m. tall, the bark 0.5 cm. thick, the wood white, leaves green, corollas yellowish (Bunpheng 1148), growing in evergreen forests, at an altitude of 350 m., blooming in March, fruiting in June, and called "makang". Bunpheng refers to it as "common" in open spaces on plains.

Additional citations: THAILAND: Bunpheng 1148 [Herb. Roy. Forest Dept. 26233] (Z); K. Larsen 9835 (Lw).

VITEX CARVALHI Gürke

Additional bibliography: Moldenke, Phytologia 5: 265. 1955; Moldenke, Résumé 146, 151, & 475. 1959.

VITEX CAULIFLORA Moldenke

Bibliography: Moldenke, Phytologia 3: 432 (1951) and 5: 265--266. 1955; Moldenke in Humbert, Fl. Madag. 174: 73, 99--101, & 272, fig. 14, 1 & 2. 1956; Moldenke, Résumé 157 & 475. 1959.

Illustrations: Moldenke in Humbert, Fl. Madag. 174: 101, fig.

14, 1 & 2. 1956.

VITEX CAULIFLORA var. **LONGIFOLIA** Moldenke

Bibliography: Moldenke, *Phytologia* 3: 433 (1951) and 5: 266. 1955; Moldenke in Humbert, *Fl. Madag.* 174: 73, 100, 101, & 272, fig. 14, 4 & 5. 1956; Moldenke, *Résumé* 157 & 475. 1959.

Illustrations: Moldenke in Humbert, *Fl. Madag.* 174: 101, fig. 14, 4 & 5. 1956.

VITEX CAULIFLORA var. **VILLOSISSIMA** Moldenke

Bibliography: Moldenke, *Phytologia* 3: 433 (1951) and 5: 266. 1955; Moldenke in Humbert, *Fl. Madag.* 174: 73, 99--101, & 272, fig. 14, 3. 1956; Moldenke, *Résumé* 157 & 475. 1959.

Illustrations: Moldenke in Humbert, *Fl. Madag.* 174: 101, fig. 14, 3. 1956.

VITEX CESTROIDES J. G. Baker

Synonymy: *Vitex cestroides* J. G. Baker ex Moldenke in Humbert, *Fl. Madag.* 174: 85. 1956.

Additional bibliography: Moldenke, *Phytologia* 5: 266--267. 1955; Moldenke in Humbert, *Fl. Madag.* 174: 72, 83--85, & 272, fig. 11, 1--3. 1956; Moldenke, *Résumé* 157 & 475. 1959.

Illustrations: Moldenke in Humbert, *Fl. Madag.* 174: 85, fig. 11, 1--3. 1956.

VITEX CHARIENSIS A. Chev.

Additional bibliography: Moldenke, *Phytologia* 5: 267. 1955; Moldenke, *Résumé* 140 & 475. 1959.

VITEX CHARIENSIS var. **LATIFOLIA** A. Chev.

Additional bibliography: Moldenke, *Phytologia* 5: 267--268. 1955; Moldenke, *Résumé* 140 & 475. 1959.

VITEX CHRYSLERIANA Moldenke

Additional bibliography: Moldenke, *Phytologia* 5: 268--269. 1955; Moldenke, *Résumé* 111 & 475. 1959.

VITEX CHRYSOCARPA Planch.

Additional bibliography: Dalz., *Useful Pl. W. Trop. Afr.* 456. 1937; Moldenke, *Phytologia* 5: 269 (1955) and 5: 356. 1956; Moldenke, *Résumé* 133, 135--138, 142, 148, 382, 391, & 475. 1959; F. R. Irvine, *Woody Pl. Ghana* 761. 1961; Huber in Hutchinson & Dalz., *Fl. W. Trop. Afr.*, ed. 2, 2: 445 & 448. 1963.

Dalziel (1937) says "In Togo the people use the wood to make fishing gear". He records the additional vernacular name "ba-kudu-né", as well as "balamagnian kan". The first of these, he notes, probably refers also to *V. barbata* Planch. Cooper records "kpar-seh" and describes the plant as a tree, 40--60 feet tall, and the trunk 10--18 inches in diameter, with buttresses.

Huber (1963) regards *V. pseudochrysocarpa* Pieper as a synonym and refers to the plant as a "Small shrub or spreading tree, especially on banks of rivers; indumentum mostly pale yellow,

flowers violet, in peduncled cymes". He cites Chevalier 2756 & 2765, Jaeger 6, Vuillet 611, and Waterlot 1116 from Mali, Chevalier 2768 and Pobéguin 232 from Guinea, Serv. For. 2408 & 2736 from Ivory Coast, Adams 4567, Dalziel 2, Kitson 688, Vigne FH.1688 and Williams 150 from Ghana, Aubréville 78d from Togo, Chevalier 24394 from Niger, Barter 388 & 1214, Dalziel 115, and Onochie FHI. 18669 & 40236 from Northern Nigeria, and Kennedy 58, Obaseki FHI. 23825, and T. Vogel 142 from Southern Nigeria.

Irvine (1961) describes the plant as "A spreading tree, bark smooth, young parts dense yellow-pubescent; leaves 3--5 foliolate, leaflets 4 x 2 in., central largest, obovate or oblanceolate, yellow-hairy below, cuspidate, upper half toothed; flowers (Mar.--Apr.) small, blue-purple, hairy, 1/2 in. long, few, in pedunculate axillary cymes; fruits (Apr.--May, Aug.) 1/2 -- 3/4 in. diam., yellow-velvety, becoming glabrous and black." He gives its distribution as "S. Leone to Nigeria" and cites from Ghana (where he says it is common in the Fringing Forest zone): Anderson 25, Dalziel s.n., Johnson 1113, Kitson 687, 688, 729, & 897, Rea 1665, Vigne 1688 & 3330, and Ll. Williams 150.

Additional citations: LIBERIA: G. P. Cooper 67 [Herb. Mus. Yale School For. 13717] (W--1378347).

VITEX CHRYSOMALLUM Steud.

Additional bibliography: Moldenke in Humbert, Fl. Madag. 174: 76, 77, 135--139, 271 & 272, fig. 21, 6. 1956; Moldenke, Résumé 157, 251, 381, 382, 386, & 475. 1959; Moldenke, Phytologia 8: 32. 1961.

Illustrations: Moldenke in Humbert, Fl. Madag. 174: 135, fig. 21, 6. 1956.

VITEX CHRYSOMALLUM var. LONGICALYX Moldenke

Bibliography: Moldenke, Phytologia 3: 431 (1951) and 5: 271--272. 1955; Moldenke in Humbert, Fl. Madag. 174: 77, 138, 139, & 272, fig. 22, 3 & 4. 1956; Moldenke, Résumé 157 & 475. 1959.

Illustrations: Moldenke in Humbert, Fl. Madag. 174: 139, fig. 22, 3 & 4. 1956.

VITEX CHRYSOMALLUM var. TOMENTELLA Moldenke

Bibliography: Moldenke, Phytologia 3: 431--432 (1951) and 5: 272. 1955; Moldenke in Humbert, Fl. Madag. 174: 77, 138, 139, & 272, fig. 22, 1 & 2. 1956; Moldenke, Résumé 157 & 475. 1959.

Illustrations: Moldenke in Humbert, Fl. Madag. 174: 139, fig. 22, 1 & 2. 1956.

VITEX CILIO-FOLIOLATA A. Chev.

Additional bibliography: Moldenke, Phytologia 5: 272--273. 1955; Moldenke, Résumé 137 & 475. 1959.

VITEX COCHINCHINENSIS P. Dop

Additional bibliography: Moldenke, Phytologia 5: 356. 1956; Mol-

denke, Résumé 177 & 475. 1959.

VITEX COFASSUS Reinw.

Additional synonymy: Vitex cofassus Reniv. & Bl. ex Moldenke, Résumé Suppl. 3: 42, in syn. 1962. Vitex confassus Reinw. ex Moldenke, Résumé Suppl. 3: 42, in syn. 1962. Vitex cofassum Reinw. ex Moldenke, Résumé Suppl. 7: 10, in syn. 1963.

Additional & emended bibliography: E. D. Merr., Interpret. Rumph. Herb. Amb. 452 & 594. 1917; H. J. Lam in Engl., Bot. Jahrb. 59: 27--28 & 92. 1924; Kanehira, Fl. Micrones. 343, 344, & 457. 1933; Moldenke, Phytologia 8: 32--34. 1961; Moldenke, Résumé Suppl. 3: 42 (1962), 7: 10 (1963), and 12: 8. 1965; Backer & Bakh., Fl. Java 2: 604. 1965; T. C. Whitmore, Guide Forests Brit. Solomon Isls. 117, 133, 142, & 205. 1966; J. C. Saunders, CSIRO Land Research Ser. 17: 174. 1967.

Recent collectors describe this species as a small tree, 5 m. tall, or a tree 10--30 m. tall, the trunk 50 cm. in diameter, the bark close, pale brownish-gray, buds white, and the fruit fleshy, dark-purplish or black when ripe. Backer & Bakhuizen van den Brink (1965) describe it as follows: "Leaves glabrous or subglabrous on both surfaces, ovate-oblong, rather long-acuminate, dark green with paler nerves above, gland-dotted beneath, 10--30 cm by 3--10.5 cm; petiole 1--8 cm. Panicles terminal and in the higher axils, combined into a 15--30 cm long terminal panicle, finely pubescent; cymes 1.5--3 cm (inclusive of 6--15 cm peduncle) [sic!]; calyx pubescent, 1 3/4 -- 2 mm high; corolla bluish violet, outside covered with sessile glands, inside (from the insertion of the stamens up to the base of the lower lip) pubescent; tube 4--5 mm; median segment of lower lip 5--6 mm; bases of filaments villous; drupe depressed-globose, dark violet, 3/4 -- 1 1/4 cm diam.....native to eastern Malesia; in Java cultivated in the Bogor Botanic Garden; also found as an escape near Bogor".

Whitmore (1966) states that this tree is found as a common big tree throughout the Solomon Islands, but not on Santa Cruz, and not in pure stands; the wood used locally to make paddles. It is called "aiululu" and "fata" there. He cites Rechinger 3748 and Waterhouse 29. Other vernacular names recorded for it are "molekewie" and "moluli". Brass found it "frequent in the canopy layer" in Papua. Saunders (1967) refers to it as common in tall alluvium forests and in mixed deciduous hill forests in New Guinea, and notes that it is occasional in irregular tall alluvium forests, tall evergreen fan forests at low altitudes, tall mixed deciduous forests, foothill and mud slope hill forests at low and medium altitudes, and in small-crowned hill forests.

The corollas are described as "blue-purple" on M. S. Clemens 10443, "violet" on Brass 21950, and "lavender" on Brass 21909. The species has been found in anthesis in July and in fruit in March. The Lam (1924) reference is often cited as "1925", but the latter date is merely the title-page date for the volume; the pages cited were published in 1924.

Additional citations: WESTERN PACIFIC ISLANDS: MARIANA ISLANDS: Agiguan: Kondo s.n. [June 3, 1952] (Bi). PALAU ISLANDS: Palau: Hosokawa 7051 (Mi). INDONESIA: GREATER SUNDA ISLANDS: Celebes: Waturandang 16 [Boschproefst. Cel/V.134] (Bi). MOLUCCA ISLANDS: Amboina: Hallalu 4 [Boschproefst. B.B.19510] (Bi). MICRONESIA: CAROLINE ISLANDS: Babelthuap: Hosokawa 7051, in part (Bi). Garo-dokku: Takamatsu 1226 (Bi), 1268 (Bi), 1363 (Bi). MELANESIA: NEW GUINEA: Northeastern New Guinea: Cavanaugh 4052 (Bi); M. S. Clemens 10443 (Mi); Fryar 3347 (Bi), 4000 (Bi); Hoogland 4869 (W--2214117); McViegh & Ridgwell 7366 (Bi); Womersley 3313 (Bi). Papua: Brass 21909 (A), 21950 (A), 29192 (W--2390813). BISMARK ARCHIPELAGO: New Britain: Floyd 6633 (Bi); Womersley & Kazakoff 7082 (Bi). New Hannover: Dissing, Kõie, & Olsen 1978 (Cp, Z). Island undetermined: Dissing, Kõie, & Olsen 2003 (Ac, Cp). SOLOMON ISLANDS: Bougainville: Kajewski 1533 (Bi), 1843 (Bi). Guadalcanal: Kajewski 2387 (Bi), 2489 (Bi), 2605 (Bi). Malaita: Kajewski 2381 (Bi). San Cristoval: Brass 2821 (Bi). Ysabel: Brass 3154 (Bi), 3272 (Bi). Island undetermined: Waterhouse 29 [Herb. Mus. Yale Sch. For. 21160] (Bi). MOUNTED ILLUSTRATIONS: H. N. Moldenke color slide 471 (Z).

VITEX COFASSUS f. ANOMALA Moldenke

Additional bibliography: Moldenke, *Phytologia* 5: 279--280. 1955; Moldenke, *Résumé* 195, 199, 225, & 475. 1959.

VITEX COFASSUS var. PUBERULA H. J. Lam

Additional bibliography: Moldenke, *Phytologia* 8: 34. 1961.

Additional citations: MELANESIA: NEW GUINEA: Northeastern New Guinea: J. H. Barrett s.n. [Pulsford 18] (Bi).

VITEX COLUMBIENSIS Pittier

Additional bibliography: Moldenke, *Biol. Abstr.* 30: 1704 & 3551. 1956; Moldenke, *Phytologia* 8: 34. 1961.

VITEX COMPRESSA Turcz.

Additional bibliography: Moldenke in Cheesman, *Fl. Trin. & Tob.* 2: 411 & 412. 1955; Moldenke, *Verb.* 30 & 31. 1955; Moldenke, *Phytologia* 8: 62. 1961.

Turczaninow's original description of this plant is as follows: "V. ramis acute tetragonis compressis glabris, faciebus canaliculatis nervosis; foliis oppositis petiolatis, foliolis 5 oblongo-lanceolatis, obtuse acuminatis, basi in petiolum parum decurrentibus integerrimis glabris, subtus vix pallidioribus, exterloribus [sic] saepe minoribus ellipticis; paniculis axillaribus tenuissime puberulis, foliis brevioribus; calyce breviter 5 dentato, tubo corollae campanulato-infundibuliformi duplo brevior. Flores lilacini. Ocana, prope Eullanada, alt. 3500 ped. Schlim No 518." An isotype, deposited in the herbarium of the Co. servatoire et Jardin Botaniques at Geneva, was photographed there by Macbride as

his type photograph number 24704.

Recent collectors describe this plant as a tree, 8 m. tall, the leaves rich-green above, dull beneath, and the calyx, pedicels, and rachis gray-green, fruiting in September. The corolla is described as "lavender" on J. A. Steyermark 86381. Additional vernacular names are "alaso abo", "guaratare", "guarataro", "pachaca", "torumillo", and "waro koeli djamaro". Stahel 349 is accompanied by a wood voucher.

Material of this species has been misidentified and distributed in herbaria as V. orinocensis H.B.K. and as Crataeva gynura L.

Additional citations: CURACAO: Arnoldo 2274 (S). COLOMBIA: Magdalena: Dugand 5663 (W--2369332); H. H. Smith 2107 (Mi, Ws). Norte de Santander: Schlim 518 [Macbride photos 24704] (W--photo of isotype). VENEZUELA: Anzoategui: H. Pittier 15069 (W--1833214). Bolívar: Bernardi 7400 (N, Ve); E. L. Little 17596 (Ve), 17618 (Ve); J. A. Steyermark 86381 (Fg, N, Ve--51115, W--2426084), 86621 (Fg, N), 86722 (Fg, N, Ve), 86916 (Fg, N), 94239 (Lw). Guárico: Aristeguieta & Agostini 6407 (Rf). Lara: Badillo 469 (Ve--18314). Yaracuy: Bernardi 6955 (Ve). State undetermined: H. Pittier 15118 [Cantaura] (Ve--1762). BRITISH GUIANA: Tutin 14 (W--1743362), 333 (W--1743519), 334 (W--1743520). SURINAM: Stahel 349 (Ws, Ws).

VITEX CONGENSIS A. Chev.

Additional bibliography: Moldenke, *Phytologia* 5: 300. 1955; Moldenke, *Résumé* 142, 419, & 475. 1959.

VITEX CONGESTA Oliv.

Additional bibliography: Moldenke, *Phytologia* 5: 300--301. 1955; Moldenke in Humbert, *Fl. Madag.* 174: 76, 129, 131--132, & 272, fig. 20, 6 & 7. 1956; Moldenke, *Résumé* 157, 274, 356, & 475. 1959.

Additional illustrations: Moldenke in Humbert, *Fl. Madag.* 174: 129, fig. 20, 6 & 7. 1956.

VITEX CONGOLENSIS DeWild. & Th. Dur.

Additional bibliography: K. Schum. in Just, *Bot. Jahresber.* 28 (1): 497. 1902; Moldenke, *Phytologia* 8: 34. 1961; Moldenke, *Résumé Suppl.* 12: 7. 1965.

Schumann (1902) is of the opinion that this taxon is conspecific with V. ferruginea Schum. & Thonn. The vernacular name, "tshikamba-tshitôma" is recorded for it from Angola, where the plant has been collected at 1100 meters altitude. In the Congo it has been found at 470 m. altitude by Louis. Material has been misidentified and distributed in herbaria as V. rufa A. Chev. The Louis 1761 and Claessens 675, cited by me as V. congolensis in my monograph, are both actually V. buchneri Gürke because of their obvious elongated petiolules.

Additional citations: LIBERIA: Dinklage 2194 (B). CONGO LEO-POLDVILLE: Louis 13889 (B). ANGOLA: Benguela: Gossweiler 12538 (UL). Lunda: Machade s.n. [Ang. Veg. 131; Gossweiler 87] (UL).

VITEX CONGOLENSIS var. GILLETII (Gürke) Pieper

Additional bibliography: Moldenke, Phytologia 5: 303. 1955; Moldenke, Résumé 142, 383, & 475. 1959.

VITEX CORDATA Aubrév.

Additional bibliography: Moldenke, Phytologia 5: 305. 1955; Moldenke, Résumé 133, 136, & 475. 1959.

VITEX COURSI Moldenke

Bibliography: Moldenke, Phytologia 3: 433—434 (1951) and 5: 306. 1955; Moldenke in Humbert, Fl. Madag. 174: 76, 128—130, & 272, fig. 20, 1 & 2. 1956; Moldenke, Résumé 157, 382, & 475. 1959.

Illustrations: Moldenke in Humbert, Fl. Madag. 174: 129, fig. 20, 1 & 2. 1956.

VITEX CRENATA A. Chev.

Additional bibliography: Moldenke, Phytologia 5: 306—307. 1955; Moldenke, Résumé 140 & 475. 1959.

VITEX CUSPIDATA Hiern

Additional bibliography: K. Schum. in Just, Bot. Jahresber. 28 (1): 497. 1902; Moldenke, Phytologia 5: 307 (1955) and 5: 357. 1956; Moldenke, Résumé 142, 147, & 475. 1959.

VITEX CYMOSA Bert.

Additional & emended synonymy: Vitex cujabensis Mart. ex Benth., Bot. Voy. Sulphur 155. 1846. Vitex cimosa Bert. ex Angely, Fl. Paran. 7: 13, sphalm. 1957. Vitex cymosa Benth., in herb.

Additional bibliography: Benth., Bot. Voy. Sulphur 155. 1846; Morong, Britton, & Vail, Ann. N. Y. Acad. Sci. 7: 199. 1893; Le Cointe, Amaz. Bras. III Arv. & Plant. Uteis, ed. 2, 456—457. 1947; Moldenke, Phytologia 5: 357. 1956; Angely, Fl. Paran. 7: 13. 1957; Tamayo, Bol. Soc. Venez. Cienc. Nat. 23: 295. 1963; Moldenke, Résumé Suppl. 12: 2. 1965; Teague, Anal. Mus. Hist. Nat. Montev., ser. 2, 7 (4): 45. 1965.

An isotype, Balbis s.n., deposited in the herbarium of the Conservatoire et Jardin Botaniques at Geneva, was photographed there by Macbride as his type photograph number 7883. Additional vernacular names recorded for the species are "jaramantaia", "tarumaã", "tarumá do alagado", "tarumá do igapó", "tarumá preto", and "totumillo". Le Cointe (1947) says that this tree is found on the inundated margins of lakes and rivers, "floresce despido de folhagem, logo que os ramos emergem da água depois da enchente anual"; the wood being "amareol-pardacenta", and the "fruto da forma e do tamanho de uma azeitona, doce, mas deixando na boca um

sabor acre". Cardona found the tree growing at 300 meters altitude. Black describes it as a tree, 66 feet tall, with a trunk diameter of 1 1/2 feet, and that an "evil smelling stagnant liquid ran out of the log after it was sawed". The species has also been found growing on hills. The corollas are described as "blue" on Arnoldo 1624. Teague (1965) reports that the wood is used for shelves and general carpentry, and medicinally as an antiluetic. He cites Teague 242 & 662 and Herb. Rojas s.n.

Material of V. cymosa has been misidentified and distributed in herbaria as V. orinocensis var. multiflora (Miq.) Huber, Godmania aesculifolia (H.B.K.) Standl., and Tabebuia sp.

Additional citations: CURACAO: Arnoldo 1624 (W—2110663), 2275 (N, N, S). COLOMBIA: Atlántico: Dugand 4452 (W—246376). Magdalena: Balbis s.n. [Bertero 2755; Macbride photos 7883] (W—photo of isotype); Haught 4039 (W—1708846); H. H. Smith 1936 (Mi, Ws). Putumayo: Cuatrecasas 11249 (W—1799678, W—1799679). Tolima: García-Barriga 3103 (W—1593364). VENEZUELA: Bolívar: Cardona 2119 (Ve). BRAZIL: Amazonas: Ducke 476 (W—1693480); Fröes 26214 (W—2248462), 26506 (N); Krukoff 4502 (W—1668301). Matto Grosso: Prance, Silva, & Murça Pires 59124 [L. S. 120] (N). Pará: G. A. Black "Project 154 F-30" (W—2250585); Black, Egler, Cavalcante, & Silva 57-19478 (S). PARAGUAY: Pedersen 4232 (W—2283729).

VITEX DEGENERIANA Moldenke

Additional bibliography: Moldenke, *Phytologia* 5: 313—314. 1955; Moldenke, *Résumé* 111 & 475. 1959; Moldenke, *Résumé Suppl.* 12: 5. 1965.

Recent collectors describe this plant as a shrub, 0.5—2.25 m. tall, the calyx-cup green, flowering in August, growing at 350—550 m. altitude in areas where much of the forest has been cleared for cultivation and is in various secondary stages and where the immediate vicinity has two types of xeromorphic woodland and gallery forest along brooks. On Eiten & Eiten 5419 the flowers are described as "upper 2 lobes of the corolla white, the 2 laterals whitish-violet, the lower light-violet, the filaments white, and the anthers purple"; on their no. 5422 there were "violet lines on the corolla leading into the white throat of the corolla-tube, the filaments white below, violet above, the anthers blackish-purple, the style white below, reddish-purple at the tip".

Additional citations: BRAZIL: Maranhão: Devereux 10 (W—2445194); Eiten & Eiten 5419 (W—2445206), 5422 (W—2445220).

VITEX DENTATA Klotzsch

Additional bibliography: Moldenke, *Phytologia* 5: 314. 1955; Moldenke, *Résumé* 151 & 475. 1959.

VITEX DINKLAGEI Gürke

Additional bibliography: Moldenke, Phytologia 5: 314--315. 1955; Moldenke, Résumé 139 & 475. 1959.

VITEX DIVARICATA Sw.

Additional synonymy: Vitex divaricata DC. ex Moldenke, Résumé Suppl. 13: 7, in syn. 1966.

Additional bibliography: Griseb., Cat. Pl. Cub. 216. 1866; Moldenke in Cheesman, Fl. Trin. & Tob. 2: 411 & 413--414. 1955; Moldenke, Verb. 30 & 32--33. 1955; Moldenke in Humbert, Fl. Madag. 174: 93 & 272. 1956; Moldenke, Phytologia 8: 35. 1961; Menninger, Flow. Trees World 284--285. 1962; Little & Wadsworth, U. S. Forest Serv. Agric. Handb. 249: 486--487. 1964; Moldenke, Résumé Suppl. 13: 7. 1966; Steyermark & Agostini, Act. Bot. Venez. 2 (2): 13, 14, & 17. 1966.

Additional illustrations: Little & Wadsworth, U. S. Forest Serv. Agric. Handb. 249: 487. 1964.

Recent collectors describe this plant as a much-branched tree, 15--45 feet tall, with a trunk diameter of 14 inches at breast height, the fruit green when immature, black when ripe, growing in mossy forests or in secondgrowth mountain rainforests, at 500 to 4600 feet altitude, flowering and fruiting in July. Webster, Ellis, & Miller refer to it as "common" in Puerto Rico, but Box calls it "very rare in mesophytic forest approaching ravine forest in character". The corollas are described as "blue" on Alain 9439 and on Webster, Ellis, & Miller 8733 and as "violet-blue" on Proctor 17797. The Cardona 2382, distributed as Vitex divaricata, is not verbenaceous.

Little & Wadsworth (1964) give a very excellent description of this tree. They describe it as a "Small to medium-sized tree with much-fissured light brown bark, rough and shreddy and separating in strips, further distinguished by: (1) opposite leaves mostly compound with 3 elliptic leaflets or often only 1 or sometimes 2, the end one larger than the others; (2) numerous showy pale purplish-blue flowers 3/8 inch long and 1/2 -- 5/8 inch across the 5 unequal corolla lobes, in lateral branching clusters; and (3) black egg-shaped fleshy fruits 1/2 inch long, with cup-like calyx at base.

"A deciduous tree 20--65 feet high and to 2 1/2 feet in trunk diameter, with rounded crown. The inner bark is light brown and slightly bitter. The twigs are greenish and minutely hairy when young, becoming gray or brown.

"The slender green petioles are 3/4 -- 2 3/4 inches long, and the leaflet stalks 1/4 inch or less in length. Leaflet blades are 2--6 inches long and 1 1/4 -- 3 inches wide, mostly short-pointed at both ends, thin or slightly thickened, above light green, beneath paler and hairy on the veins.

"Often the ground under a tree in flower has a bluish tinge from the numerous fallen corollas. Flower clusters (cymes) 2--6 inches long at base of leaves bear several to many slightly fragrant flowers on short slender stalks. The flower about 3/8 inch

long has a cuplike calyx less than 1/8 inch high and broad; pale blue or purplish-blue irregular finely hairy corolla with narrow tube 1/4 inch long and 5 unequal, spreading, wavy-margined lobes, 1 much larger than the others; 4 stamens 1/4 inch long in 2 pairs inserted on corolla tube and slightly protruding; and pistil 3/8 inch long with 4-celled ovary and slender style 2-forked at end.

"The fruit (drupe) contains a large 4-celled and 4-seeded stone. In maturing, fruits change color from yellow green to brownish and black. Observed in flower from February to July and in fruit from June to November.

"The grayish sapwood turns light brown upon drying. The heartwood when freshly cut is tan to brown, generally variegated with darker shades, and afterwards becomes gray brown to deep brown, often with indistinct, narrow, lighter or darker bands. The wood is hard, heavy (specific gravity 0.62), strong, tough, and fine-textured and has irregular, interlocking grain and well-defined growth rings. Air-seasoning is too slow to be practicable commercially. Amount of degrade is minor. Machining characteristics are as follows: planing and resistance to screw splitting are poor; shaping, boring, and mortising are good; turning is excellent; and sanding is fair. The wood works easily and takes a fine polish. It is moderately resistant to dry-wood termites and is durable in contact with the ground.

"The wood is used for framework of houses, fenceposts, construction, cabinetwork, and elsewhere for shingles. It should be suitable also for sporting goods, tool handles, boats, and flooring.

"Planting tests show this species to grow slowly and to require nearly full sunlight. The trees, which become covered with flowers, are suitable for ornamentals also. They can be propagated from cuttings and grow rapidly in open areas. A honey plant.

"Widely distributed in coastal limestone, and lower mountain regions of Puerto Rico. Also in St. Croix, St. Thomas, St. John, and Tortola....Range. -- Cuba, Hispaniola (Haiti), Puerto Rico and Virgin Islands, and throughout Lesser Antilles to Grenada and Trinidad and Tobago. Also in Venezuela and Guianas."

They recommend the common names "higüerillo" and "white fiddlewood", but say "Other common names. -- pándula, pendula blanca (Puerto Rico); roble guayo, roble de olor, ofón criollo (Cuba); totumillo (Venezuela); fiddlewood (St. Kitts, St. Vincent); white fiddlewood (Montserrat); bois lézard (Dominica); black fiddlewood (Trinidad); timber fiddlewood (Tobago); bois lézard, bois à agouti (Guadeloupe, Martinique)."

Additional citations: HISPANIOLA: Dominican Republic: R. A. Howard 12207 (Mi, N, S). PUERTO RICO: Alain 9439 (N), 9967 (G, Ij, N, N, S, Sj, W); Webster, Ellis, & Miller 8733 (Mi, S). LEEWARD ISLANDS: Antigua: Box 1006 (Mi). WINDWARD ISLANDS: Martinique: Stehle & Stehle 6024 (W--2453652). St. Lucia: Proctor 17797 (N). VENEZUELA: Aragua: Ll. Williams 11119 (W--1778874, W--2407802). Federal District: Vivas 54412 (Ve).

VITEX DIVARICATA var. *CUBENSIS* Urb.

Additional bibliography: Moldenke, *Phytologia* 8: 35. 1961; Jiménez, *Supl. Cat. Fl. Doming.* 1: 221--222. 1966.

Additional citations: CUBA: Havana: P. Wilson 1066 (W—1584487). Las Villas: C. F. Baker 3409 (W—1584493). Oriente: Ekman 6206 (Mi).

VITEX DIVERSIFOLIA Kurz

Additional bibliography: Moldenke, *Phytologia* 5: 321. 1955; Moldenke, *Résumé* 166 & 476. 1959.

VITEX DJUMAENSIS DeWild.

Additional bibliography: Moldenke, *Phytologia* 5: 321--322. 1955; Moldenke, *Résumé* 142 & 476. 1959.

VITEX DONIANA Sweet

Additional synonymy: *Vitex cienkovskii* Kotsch. & Peyr., in herb.

Additional & emended bibliography: Aschers. in G. Schweinf., *Beitr. Fl. Aethiop.* 278. 1867; K. Schum. in Just, *Bot. Jahresber.* 28 (1): 497 & 498. 1902; Volkens, *Notizbl. Bot. Gart. Berl.* 5, App. 22 (2): 34--35, fig. 12. 1909; J. H. Holland, *Kew Bull. Addit. Ser.* 9 [Useful Pl. Nigeria 3]: 525--526. 1915; Unwin, *W. Afr. Forest.* 398. 1920; F. R. Irvine, *Fl. Gold Coast* xlii, lxvi, & 436--437. 1930; Hutchinson & Dalz., *Fl. W. Trop. Afr.*, ed. 1, 2: 277. 1931; Dalz., *Useful Pl. W. Trop. Afr.* 456--457. 1937; Aubrév., *Fl. Forest. Soudano-Guin.* 504, pl. 113, 1 & 2. 1950; Berhaut, *Fl. Sénégal* 21. 1954; Moldenke in Humbert, *Fl. Madag.* 174: 72, 93--96, & 272, fig. 13, 1. 1956; Aubrév., *Fl. For. Cot. Iv.*, ed. 2, 3: 230, pl. 335, fig. 1 & 2. 1959; F. R. Irvine, *Woody Pl. Ghana* 761. 1961; Moldenke, *Phytologia* 8: 63. 1961; Jaeger & Winkoun, *Bull. Inst. Franç. Afr. Noir* 24 [ser. A, no. 1]: 81. 1962; Cuf., *Senck. Biol.* 43: 283. 1962; Cuf., *Bull. Jard. Bot. Brux.* 32: *Suppl.* 797. 1962; *Espirito Santo, Junt. Invest. Ultramar Est. Ens. & Docum.* 104: 21, 27, 31, 33, 40, 46, 48, 51, 64, & 118. 1963; Huber in Hutchinson & Dalz., *Fl. W. Trop. Afr.*, ed. 2, 2: 445--447, fig. 308. 1963; H. P. Riley, *Fam. Flow. Pl. S. Afr.* 129. 1963; Lawton, *Kirkia* 3: 58, 72, & 73. 1963; F. White, *Webbia* 19: 680. 1965; Moldenke, *Résumé Suppl.* 12: 13. 1965; Nielsen, *Introd. Flow. Pl. W. Afr.* 73, 75, 80, 82, 85, & 162--164, fig. 43b. 1965.

Additional illustrations: Volkens, *Notizbl. Bot. Gart. Berl.* 5, App. 22 (2): 35, fig. 12. 1909; Aubrév., *Fl. Forest. Soudano-Guin.* pl. 113, 1 & 2. 1950; Moldenke in Humbert, *Fl. Madag.* 174: 95, fig. 13, 1. 1956; Aubrév., *Fl. For. Cot. Iv.*, ed. 2, 3: pl. 335, fig. 1 & 2. 1959; Huber in Hutchinson & Dalz., *Fl. W. Trop. Afr.*, ed. 2, fig. 308. 1963; Nielsen, *Introd. Flow. Pl. W. Afr.* fig. 43b. 1965.

Recent collectors and authors describe this plant as a small or medium-sized tree, 8--60 feet tall, with a girth of up to 4 feet, much-branched, completely deciduous; bole straight; crown hemispheric; bark scaly, light-gray, longitudinally fissured,

peeling easily; young stems yellowish; branchlets glabrous or pubescent; leaves hard, leathery, digitate; petioles blackish, with a distinct bow or curve from the horizontal plane; leaflets 5, the two basal ones small, stalked, obovate, about 6 inches long and 3 inches wide, rounded at the apex, cuneate at the base, dark- or rather light-green above, paler beneath, with 10 pairs of secondaries; flowers small, fragrant, borne in stout, brown-hairy, axillary, densely-flowered cymes, 1 or 2 opening at a time, white or yellowish with blue-purple centers; fruits subglobose, 3/4 inch long, large, black, edible, glabrous.

The fruits are galled on Carrisso & Mendonca 157. The corollas are described as "blue" on Barbosa 2155, "violet" on Gomes e Sousa 4395 and Torre 3688 & 5196, "purple" on Faulkner 1163, "mauve" on Tanner 1758, "dull creamy-white and purple lips" on Faulkner 2441, "white, lower lip violet" on Mendonca 2304, "white, spotted with lilac" on Barbosa 1763, "brown-hairy outside, upper lobes white inside, lower lip blue, yellow in throat" on Harley 9467, "lower lip violet with yellow spot" on Mendonca 1343, and "lívida, com os lábios internamente róseos" on Mendonca 654.

The species has been found growing in wet or gallery forests, coastal bush, wet ground or wet sandy soil, open forests of Brachystegia spp. and Julbernardia globiflora, deciduous forests of Brachystegia and Isoberlinia, almost in the water on river-banks, and on shrubby savannas with Hyphaene sp., Kigelia pinna-ta, Combretum spp., and Sclerocarya caffra, at altitudes of from sealevel to 3000 feet, flowering from January to April and August to October, and fruiting from February to April and June to August. Harley refers to it as "frequent in forest along margin of rocky river" in Tanganyika. Huber (1963) says "Widespread in tropical Africa extending to the Comoro Islands" and dates the original publication by Sweet as "1827". The larger leaflets on Simão 251 are repand-crenate toward the apex. F. A. Mendonca 3890 is said to match well Buchanan 194 & 340, Dandy 661, Dummer 2779, Schlieben 6456, and Swynnerton 1056, 1058, & 2037 in the herbarium of the British Museum.

Additional vernacular names recorded for this species are "abis(wa)", "afua", "bessápale", "black fô", "búmè", "burzun dinya", "cetona", "cutubulô", "cutábulô", "dyolo", "ëbissaa", "edin", "fɔyitɔ" [black V. grandifolia tree], "fɔyitɔ", "fəyiti", "fɔyiti", "fɔti", "fəti", "gua", "gda", "hubvo", "kw'allon 'dinya", "mansopane", "m'cubvo", "mecuvo", "m'fuvo", "molha", "monsopane", "mpindmbi", "mpurro", "mucubvo", "mucurro", "mucuvo", "muhuro", "muni", "mansopane", "munuro", "nailu", "n'bumbo", "nhanhahuro", "nyalbihi", "ôri of the open country", "puryutɔ", "saman bir", "sô", "soɔ", "sodtɔ", "sôttɔ", "tshikamba-tshitoma", "tshilongulongu tshá mushitu", "ubumbo", "um-dugulgun", "uôli", and "Eji". The names "búmè" and "cetona" are, however, also applied to V. madiensis Oliv.

Dalziel (1937) gives an excellent summary of the uses made of

this plant: "Often planted or retained in villages for the fruit and for the young leafy shoots, which can be used as a pot-herb. The ripe fruits resemble black plums. A Fulani proverb says 'the galbiye of the blind man do not ripen'. They are sweet and edible; a kind of black molasses (Hausa ma'di) is made from them, generally mixed with that of other fruits (Detarium, Diospyros, etc.) by extracting the pounded pulp in a basket by repeated pouring of water and then concentrating by boiling, or candied to form alewa (see Cordia abyssinica). In Sierra Leone they are regarded as a good remedy for conditions due to A and B avitaminosis, associated with sores at the mouth and eyes, and sometimes paralytic symptoms in advanced cases. A beverage can be made from them (as from those of V. grandifolia). In E. Sudan the fruits are roasted and said to be a substitute for tea (Broun & Massey).

"Ink is made by boiling the black fruit and young leaves, dried in the sun or over a fire, to make a thick extract with gum which has been boiled separately; some make it from the bark. In N. Nigeria the bark is used mixed with the fragrant resin of Boswellia in one method of making ink. The bark is said to yield a dye used for cloth in Western Ashanti (Irvine).

"The young fresh leaves, mixed with groundnuts, salt, pepper, etc., form a food sold under the name of dinkin 'dinya' (see also under Celtis integrifolia). The fruit, and in some cases the bark and leaves, are given for diarrhoea and dysentery. In French Guinea an infusion of the leaves is given for colds, and a decoction of the pounded roots for stomach troubles (Pobéguin, Pl. Méd. Guin. 65). In N. Nigeria Loranthus growing on this tree is a remedy for leprosy (see also under Sapium Grahamii).

"The flowers and ripe fruits attract bees, and the hives are commonly put in the branches. In Gold Coast, N. Terr., it is being planted as a fodder tree.

"The wood is whitish to light brown, turning darker, of medium weight, easily worked, not polishing. It has some resemblance to teak, and is suitable for furniture, etc. It is used locally for boat timbers, ribs, etc., small canoes, house-building, drums, etc."

Irvine (1961) reports that in Ghana a sweetmeat is made from these and other fruits and that the "Bark and roots used to prepare a cloth dye (for Adink(a)ra cloths) are cut up" and "boiled with iron slag as mordant". He tells us that the wood is used for firewood and that the tree is found "in grass savannas, deciduous and secondary forests, thrives on very dry and gravelly soil", the very sweet edible fruit being sold in native markets (elephants are very fond of them); the bark used for stomach complaints. Nielsen (1965) says that this is the commonest species of the genus in western Africa, common on savannas and in open places, especially farmlands near villages, the young leafy shoots being used as a potherb. "This species and oil palm found on farmlands and savanna regrowth; planted and preserved trees are a

conspicuous feature; in open woodland savannas; in undisturbed areas of transition belt between woodland savanna and fringing forest strip; in riparian woodlands; planted for their fruits or preserved in brush clearing." Riley (1963) reports that it is used in the treatment of anemia and gonorrhea.

The Barbosa 1938 & 2092, distributed as the typical form of this species, are actually var. parvifolia (Engl.) Moldenke.

Irvine (1961) cites the following specimens from Ghana: Beveridge 2928; Brown 2321; Chipp 463, 727, & 744; Irvine 151, 194, 1810, & 1961; Kitson 690, 692, 888, & 946; Moore 2340; Saunders 3; and Vigne 1810 & 3541. Huber (1963) cites the following: DAHOMEY: Poisson s.n. MALI: Chevalier 164 bis, 2766, & 2769; Davey 500/102; Jaeger 17. SENEGAL: Chevalier 2757 & 2758; Haudelot 379. PORTUGUESE GUINEA: Espirito Santo 1735. GUINEA: Caille s.n. [Chevalier 14799], Chevalier 12866; Pobéguin 682; Scott Elliot 5211. SIERRA LEONE: Deighton 2841 & 3052; Lane-Poole 1; Miszewski 33; Thomas 2824. IVORY COAST: Aubréville 428 bis, 806, & 1244. GHANA: Ankrah GC.20347; Chipp 463, 727, & 744; Irvine 194; Saunders 3. TOGOLAND: Warnecke 156. NIGERIA: Northern: Barter 1108; Jones FHI.675; Lafia FHI.7758; Lely P.134; Yates 59. Southern: Brenan 8956; Chesters 190; Hepper 2225; Millen 118; A. F. Ross R.71. CAMEROONS: Daramola FHI.40485; Hepper 1921; Latilo & Daramola FHI.28927 & FHI.34485; McClintock 175.

Additional citations: TANGANYIKA: H. G. Faulkner 1163 (B), 1202 (B); R. M. Harley 9467 (S); Tanner 1758 (B). ZANZIBAR: H. G. Faulkner 2441 (S). ANGOLA: Lunda: Barros Machado s.n. [Ang. Veg. 173] (U); Carrisso & Mendonca 157 (U); Fontinha 14265 (U). PORTUGUESE EAST AFRICA: Cabo Delgado: Andrada 1352 (U); Barbosa 2155 (U), 2277 (U); M. F. Correia 229 (U); F. A. Mendonca 1033 (U); Torre & Paiva 9713 (U). Manica e Sofala: Andrada 1204 (U); Barbosa 845 (U), 955 (U), 1578 (U); Garcia 46 (U), 60 (U), 129a (U), 432 (U); B. Goldsmith 128/62 (U); F. A. Mendonca 3890 (U), 4394 (U); Simão 251 (U), 563 (U); Torre 3030 (U), 4039 (U); Torre & Paiva 9106 (U). Mozambique: Barbosa 1763 (U); Gomes e Sousa 849 (U), 4395 (U). Niassa: Gomes e Sousa 4079 (U), 4113 (U), 4136 (U); F. A. Mendonca 654 (U), 783 (U). Tete: Andrada 1742 (U); F. A. Mendonca 501 (U); Torre 3688 (U), 4569 (U). Zambezia: F. A. Mendonca 1343 (U), 2304 (U, U); Torre 3470 (U), 3662 (U), 4439 (U), 4808 (U), 4923 (U), 5196 (U).

VITEX DONIANA var. PARVIFOLIA (Engl.) Moldenke

Additional bibliography: Moldenke, Phytologia 8: 36. 1961.

Recent collectors describe this plant as a tree, 10 m. tall, growing on termitaria, at altitudes of 65 to 1330 m., flowering in August and September, and called "lómùè", "m'purro", "muhuro",

and "nhanhahuro".

Additional citations: UGANDA: Dummer 2779 (W-1172991); Mearns 2564 (W-632527). PORTUGUESE EAST AFRICA: Cabo Delgado: Barbosa 1938 (UL), 2092 (UL). Tete: Andrada 1767 (UL). Zambezia: Andrada 1914a (UL). Province undetermined: Andrada 1324 (UL).

VITEX DRYADUM S. Moore

Additional bibliography: Moldenke, *Phytologia* 5: 327. 1955; Moldenke, *Résumé* 151 & 476. 1959.

VITEX DUBOISII Moldenke

Bibliography: Moldenke, *Phytologia* 4: 60--61 (1952) and 5: 327--328. 1955; Moldenke, *Résumé* 142 & 476. 1959.

VITEX DUCKEI Huber

Additional & emended bibliography: Le Cointe, *Amaz. Bras. III Arv. & Plant. Uteis*, ed. 1, 429 (1934) and ed. 2, 455--456. 1947; Moldenke, *Phytologia* 8: 36. 1961.

Le Cointe (1947) states that this tree is found on terra firme "nas campinas de areia con humus" and records the vernacular name "tarumá do campo".

A specimen of Ducke 106 deposited in the herbarium of the Botanisches Museum at Berlin was photographed there by Macbride as his type photograph number 17560 (although it is not one of the cotypes on which the name is based), but is now destroyed.

Additional citations: BRAZIL: Amazonas: Ducke 106 [Macbride photos 17560] (W-1693111, W-photo).

VITEX DUCLOUXII Dop

Additional bibliography: Moldenke, *Phytologia* 5: 330. 1955; Moldenke, *Résumé* 171 & 476. 1959.

VITEX EBERHARDTII Dop

Additional bibliography: Moldenke, *Phytologia* 5: 330--331. 1955; Moldenke, *Résumé* 177 & 476. 1959.

VITEX ELAKELAKENSIS Moldenke

Bibliography: Moldenke, *Phytologia* 3: 434--435 (1951) and 5: 331--332. 1955; Moldenke in Humbert, *Fl. Madag.* 174: 76, 124--126, & 272, fig. 19, 1--3. 1956; Moldenke, *Résumé* 157 & 476. 1959.

Illustrations: Moldenke in Humbert, *Fl. Madag.* 174: 125, fig. 19, 1--3. 1956.

VITEX EPIDICTYODES Mildbr.

Synonymy: Vitex epidictyoides Mildbr. ex Moldenke, *Phytologia* 8: 36, sphalm. 1961.

Additional bibliography: Moldenke, *Phytologia* 8: 36. 1961.

VITEX FARAFANGANENSIS Moldenke

Bibliography: Moldenke, *Phytologia* 3: 435--436 (1951) and 5:

334. 1955; Moldenke in Humbert, Fl. Madag. 174: 74, 105—107, & 272, fig. 15, 5—7. 1956; Moldenke, Résumé 157 & 476. 1959.

Illustrations: Moldenke in Humbert, Fl. Madag. 174: 105, fig. 15, 5—7. 1956.

VITEX FERRUGINEA Schum. & Thonn.

Additional & emended synonymy: Vitex ferruginea Schum. in Just, Bot. Jahresber. 28 (1): 497. 1902. Vitex fosteri C. H. Wright, Kew Bull. Misc. Inf. 1908: 437. 1908.

Additional & emended bibliography: K. Schum. in Just, Bot. Jahresber. 28 (1): 497. 1902; C. H. Wright, Kew Bull. Misc. Inf. 1908: 437. 1908; J. H. Holland, Kew Bull. Addit. Ser. 9 [Useful Pl. Nigeria 3]: 526. 1915; Unwin, W. Afr. Forest. 399. 1920; Pieper in Engl., Bot. Jahrb. 62, Beibl. 141 ["142"]: 50, 68, 70, & 81, pl. 10. 1928; F. R. Irvine, Pl. Gold Coast 437. 1930; Hutchinson & Dalz., Fl. W. Trop. Afr., ed. 1, 2: 276. 1931; Dalz., Useful Pl. W. Trop. Afr. 457. 1937; Worsdell, Ind. Lond. Suppl. 2: 500. 1941; H. N. & A. L. Moldenke, Fl. Life 2: 60. 1948; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 111—113, 119, & 201. 1949; Moldenke in Humbert, Fl. Madag. 174: 104 & 272. 1956; Moldenke, Résumé 136, 137, 142, 147, 383, & 476. 1959; Aubrév., Fl. For. Cot. Iv., ed. 2, 3: 233, pl. 337a. 1959; Moldenke, Phytologia 8: 63. 1961; Huber in Hutchinson & Dalz., Fl. W. Trop. Afr., ed. 2, 2: 446 & 447. 1963; Moldenke, Phytologia 15: 99. 1967.

Illustrations: Pieper in Engl., Bot. Jahrb. 62, Beibl. 141 ["142"]: pl. 10. 1928; Aubrév., Fl. For. Cot. Iv., ed. 2, 3: pl. 337a. 1959.

Schumann (1902) regards V. congolensis DeWild. & Th. Dur. as a synonym of V. ferruginea; certainly they are very closely related. Vitex fosteri was maintained as a valid species by me in my previous publications, but is reduced to synonymy here on the authority of Huber (1963).

Irvine (1930) describes the bark of V. ferruginea as thin and stringy and the fruit "like a small plum", and records the vernacular name "Əwentərowa" [meaning "antelope's garden egg"]. Huber (1963) describes the plant as a "Tree 15—50 feet high with ochre indumentum on inflorescences and young parts; flowers pink to purple, sometimes almost cauliflorous; in closed forest....Also in Congo". He cites the following specimens: PORTUGUESE GUINEA: Es-pirito Santo 1948 & 2059. GUINEA: Baldwin 9678. SIERRA LEONE: Deighton 3077, 3128, 3520, 3534, & 6085. LIBERIA: Baldwin 9430. IVORY COAST: Aubréville 154, 421, & 938. GHANA: Hall 1509; Thompson 37; Vigne FH.1761, FH.1876, & FH.1893. NIGERIA: Southern: Ainslie 129 & 139; Dalziel 1246; Foster 34; Unwin 9; C. H. Wright R.135.

The species has been collected in anthesis from March to May and in August, and in fruit in June, July, September, and October. Dalziel (1937) says "The wood is white, soft, used for house-posts,

etc.; durable for interior work, and also for verandah posts, door and window-frames, etc."

Additional citations: GUINEA: Thonning 265 (Cp, N--photo, Z--photo). UGANDA: Dummer 757 (W--634598).

VITEX FISCHERI Gürke

Additional bibliography: Shantz & Turner, Photog. Decum. Veg. Changes 156 & 158, fig. 46a & 51b. 1958; Moldenke, Phytologia 8: 37. 1961; Lawton, Kirkia 3: 74. 1963.

Illustrations: Shantz & Turner, Photog. Docum. Veg. Changes fig. 46a & 51b. 1958.

Lucas describes this plant as a tree, about 40 feet tall, the "flowers pale-lilac all over except for the lower lip which is darker and almost purple", growing at forest edges, at 5300 feet altitude, flowering in June. Shantz & Turner (1958) cite their no. 4235 from "Belgian Congo and Ruanda-Urundi", although the labels accompanying this collection indicate that it was gathered in Tanganyika! They also record the species from Uganda, but I have seen no material as yet from either the Congo or Uganda.

Additional citations: KENYA: G. L. Lucas 131 (S, Z).

VITEX FLAVA Ridl.

Additional & emended bibliography: H. N. Ridl., Kew Bull. Misc. Inf. 1929: 261--262. 1929; Anon., Kew Bull. Gen. Index 1929-1956, 293. 1959; Moldenke, Phytologia 8: 37. 1961.

VITEX FLAVENS H.B.K.

Additional & emended bibliography: Bocq., Adansonia 3: [Rev. Verbenac.] 253. 1863; Le Cointe, Amaz. Bras. III Arv. & Plant. Uteis, ed. 1, 429 (1934) and ed. 2, 456. 1947; Moldenke, Phytologia 5: 336 (1955) and 5: 359--361. 1956; Moldenke, Biol. Abstr. 30: 3551. 1956; Moldenke, Résumé 49, 69, 81, 85, 111, 383, 388, & 476. 1959.

Recent collectors describe this plant as a small tree, 5 m. tall, with a trunk diameter of 15 cm. at breast height, the bark gray, with many deep longitudinal furrows, the wood "resistente, para segeria, moirões, esteios, dormentes -- Cor parda escura", with a density of 0.65, called "mameira" or "tarumá taira", inhabiting dry upland scrub forests, as well as campos or terra firma, at 1400 feet altitude. Le Cointe (1947) records it from Marajó Island.

The type, Humboldt & Bonpland s.n., deposited in the herbarium of the Muséum National d'Histoire Naturelle at Paris, was photographed there by Macbride as his type photograph number 39494.

Material has been misidentified and distributed in herbaria as Tabebuia sp. On the other hand, the Ducke 2488, distributed as V. flavens, is actually V. panshiniana Moldenke.

Additional citations: COLOMBIA: Huila: E. L. Little 9137 (W--2140885). PERU: Province undetermined: Humboldt & Bonpland s.n. [Herb. Willdenow 11710; Macbride photos 39494] (W--photo of type).

VITEX FLORIBUNDA Legris

Bibliography: Legris, Trav. Sect. Scient. Inst. Franç. Pond. 6: 520 & 586. 1963.

I know nothing of this taxon other than that it is referred to in the reference given above.

VITEX FLORIDULA Duchass. & Walp.

Additional bibliography: Moldenke, Phytologia 8: 37. 1961.

The corollas are described as "light-violet" on P. H. Allen 259.

Additional citations: PANAMA: Panamá: P. H. Allen 259 (Du--358187).

VITEX FROESII Moldenke

Additional bibliography: Moldenke, Phytologia 5: 363. 1956; Moldenke, Résumé 111 & 476. 1959.

VITEX GABUNENSIS Gurke

Additional bibliography: Moldenke, Phytologia 5: 363--364. 1955; Moldenke, Résumé 110 & 476. 1959.

VITEX GAMOSEPALA Griff.

Additional & emended bibliography: Fletcher, Kew Bull. Misc. Inf. 1938: 432 & 436--437. 1938; Anon., Kew Bull. Gen. Index 1929-1956, 293. 1959; Moldenke, Phytologia 8: 63. 1961.

The H. H. Bartlett 6919, Boeea 7155, 7184, 7245, 7532, 7821, 7971, & 8126, and Yates 2036, distributed as typical V. gamosepala, are actually all var. kunstleri King & Gamble.

VITEX GAMOSEPALA var. KUNSTLERI King & Gamble

Additional bibliography: Moldenke, Phytologia 8: 38. 1961.

Boeea refers to this plant as a tree, growing in old jungles, at 2500 feet altitude, known locally as "kajoe giak batoe", "kajoe hae aek", or "kajoe homos". The corolla is said to have been yellow on H. H. Bartlett 6919; a wood sample accompanies this collection as well as Boeea 7532. Material has been misidentified and distributed in herbaria as typical V. gamosepala Griff. and as V. vestita Wall.

Additional citations: INDONESIA: GREATER SUNDA ISLANDS: Sumatra: H. H. Bartlett 6919 (Mi); Boeea 7155 (Mi), 7184 (Mi, Mi, Mi), 7245 (Mi), 7532 (Mi, Mi), 7821 (Mi), 7971 (Mi), 8126 (Mi, Mi), 8501 (Mi, Mi); Yates 2036 (Mi).

VITEX GAMOSEPALA var. SCORTECHINII King & Gamble

Additional bibliography: Moldenke, Résumé 181, 188, & 476. 1959; Moldenke, Phytologia 8: 63. 1961.

VITEX GARDNERIANA Schau.

Additional bibliography: Sampaio, Bol. Mus. Nac. Rio Jan. 13: 234. 1937; Moldenke, Phytologia 8: 38. 1961.

A cotype, G. Gardner 1107, deposited in the herbarium of the

Conservatoire et Jardin Botaniques at Geneva, was photographed there by Macbride as his type photograph number 28400.

Additional citations: BRAZIL: Ceará: Cutler 8263 (W--1989699). Pernambuco: G. Gardner 1107 [Macbride photos 28400] (W--photo of cotype).

VITEX GAUMERI Greenm.

Additional & emended bibliography: P. C. Standl., *Contrib. U. S. Nat. Herb.* 23: 1235 & 1236. 1924; C. L. Lundell, *Contrib. Univ. Mich. Herb.* 8: 61. 1942; Moldenke, *Phytologia* 8: 63. 1961; Menninger, *Flow. Trees World* 18--19 & 284. 1962; Shelford, *Ecol. N. Am.* 409 & 607. 1963; Gómez Pompa, *Bol. Soc. Bot. Mex.* 29: 94. 1965.

Additional synonymy: Vitex guameri Greenm., in herb.

Recent collectors describe this plant as a tree or large tree, 50 feet tall, the trunk thick, 40 inches in diameter, often with cavities at the base, the bark brown and ridged, growing in moist ground near the edge of forests, known as "crucillo", "Mexican vitex", or "yáaxnik". Hunt refers to it as "common in hardwood forests on limestone". The corollas are described as "blue" on Gentle 4646, "deep-blue" on D. R. Hunt 474, and "purple" on Chute M.110. Material has been misidentified and distributed in herbaria as *V. pyramidata* B. L. Robinson.

Additional citations: MEXICO: Campeche: Marroquín 148 (Ip, Ws). Chiapas: Gómez Pompa 318 (W--2448148). Guerrero: Chute M.110 (Mi). Yucatán: Collector undetermined 4 [wood no. 11080] (Ws); G. F. Gaumer 607 [Herb. Field Mus. 15599] (Ws--isotype); Lundell & Lundell 7321 (Du--362989, Rf). GUATEMALA: Alta Verapaz: J. A. Steyermark 45782 (Rf). El Petén: Contreras 855 (Ld, S), 2336 (Ld, S), 2526 (Ld, S); C. L. Lundell 15887 (Ld), 15983 (Ld, S), 16079 (Ld, Mi), 17112 (Ld). BRITISH HONDURAS: Gentle 4646 (Mi, Rf, Rf), 9083 (Ld); D. R. Hunt 474 (W--2398888).

VITEX GEMINATA H. H. W. Pearson

Additional bibliography: Moldenke, *Phytologia* 5: 373. 1956; Moldenke, *Résumé* 154 & 476. 1959.

VITEX GIGANTEA H.B.K.

Synonymy: Vitex gigantea Humb. & Kunth ex Benth., *Bot. Voy. Sulphur* 154. 1846.

Additional bibliography: Benth., *Bot. Voy. Sulphur* 154--155. 1846; Bocq., *Adansonia* 3: [Rev. Verbenac.] 253. 1863; Moldenke, *Phytologia* 5: 373. 1956; Moldenke, *Résumé* 81, 85, 225, & 476. 1959; Soukup, *Biota* 5: 137. 1964.

Additional citations: ECUADOR: El Oro: E. L. Little 6634 [U. S. Dept. Agr. Forest Serv. 95915] (W--1876237). Guayas: Dodson & Thien 1290 (Z). Los Ríos: Myer & Little 6504 [U. S. Dept. Agr. Forest Serv. 95914] (W--1876221).

VITEX GIORGII DeWild.

Additional bibliography: Moldenke, *Phytologia* 5: 355 & 375--

376. 1956.

VITEX GLABRATA R. Br.

Additional synonymy: Pitex heterophylla Roxb. ex Moldenke, Résumé Suppl. 3: 34, in syn. 1962.

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BOOK REVIEW

Alma L. Moldenke

"The Galápagos" - Proceedings of the Symposia of the Galápagos International Scientific Project of 1964 - edited by Robert I. Bowman, xvii & 318 pp., illus., University of California Press of Berkeley & of Los Angeles, California, and Cambridge University Press of London, England. 1966. \$10.00

With the expressed unifying theme of evolution, with the original intention of collecting and collating background information for the fortunate participants in this undertaking, and now with the presenting of this scientific knowledge of these fascinating islands to many biologically, geologically and generally interested readers, the editor and the authors have produced forty valuable, well documented papers, a fine introduction and a useful 4-column index (even though it missed Cornutia which appears twice on p. 188 albeit as misidentifications and with the binomials incorrectly accredited).

Everything about this book is outstanding from the fine quality of the paper, print and color photography, the reasonable price, to the excellence of the authors in their specializations and writings. It opens impressively with Sir Julian Huxley's "Charles Darwin: Galápagos and After". Papers of predominantly botanical interest deal with

variation and adaptation by Stebbins
origins and relationships of the flora by Wiggins
botany of Cocos Island by Fournier
plant lists from Cocos Island by Fosberg and Klawe
lichenology and bryology with check lists by Weber
origin and dispersal of native cottons by Stevens and Rick
cacti and their relations with tortoises by Dawson
plant-animal relations by Rick
pollinating insects by Linsley
oceanic volcanic island ecosystems by Fosberg
conservation by Acosta-Solis

Besides imparting valuable information, reading this book creates the same effect as does a most alluring travel folder.

SUPPLEMENTARY STUDIES IN AESCHYNOMENE, II: SERIES PLEURONERVIAE

Velva E. Rudd

Among the specimens collected in Brazil by H. S. Irwin et al. during 1965-1966 is material of an interesting leguminous plant, apparently a new species of Aeschynomene. I am referring it to my series Pleuronerviae (Contr. U. S. Nat. Herb. 32: 1-172. 1955) although, in this case, the acicular leaflets are reduced to little more than the costa.

Another specimen is a good match for Glaziou 20921, which was cited as "Ae. nana Glaz. n. sp. ?", but without adequate description. I now believe Ae. nana to be a good species rather than a synonym of Ae. paucifolia, as I treated it in 1955.

Following is the necessary documentation to validate the names of those two taxa and a revised description of Ae. paucifolia reflecting the separation of Ae. nana from it.

I have also constructed a tentative key to the Brazilian species of series Pleuronerviae as I currently understand them. Unfortunately, I am as yet unsure of the exact delimitation of some of them, particularly, Ae. brevipes, Ae. leptostachya, Ae. marginata with its two varieties, and Ae. racemosa. At the time of writing my first paper on Aeschynomene, cited above, I did not have access, except in a few cases, to specimens from European herbaria, including critical types. I hope to see such material in the near future and to prepare a treatment of Aeschynomene and related genera for the Flora Neotropica.

Key to species of Aeschynomene (series Pleuronerviae) in Brazil:

Leaflets acicular, about 12-25 mm. long and 0.5 mm. wide; stipe of fruit 7-8 mm. long Ae. irwinii

Leaflets semi-cordate to oblong, subfalcate or falcate, 2-20 mm. long and 0.5-7 mm. wide, the length about 2 times the width; stipe of fruit 1-5 mm. long.

Costa of leaflets marginal, the leaflets semi-cordate.

Stems slender, weak, to about 35 cm. high; flowers 10-13 mm. long; articles of fruit about 5 mm. long and 3 mm. wide, appressed-pubescent Ae. nana

Stems erect, to about 2 m. high; flowers 6-10 mm. long; articles of fruit about 6.5-7 mm. long and 6 mm. wide; minutely patent-pubescent Ae. paucifolia

Costa of leaflets excentric but not marginal.

Leaflets falcate-ovate, about 10-20 mm. long and 5-7 mm. wide Ae. oroboides

Leaflets oblong, 2-14 mm. long and 1-4 mm. wide.

Length of leaflets about 6-15 mm., the width 1.5-3 mm.

Fruit with articles crisp-pubescent; leaflets 3-4 mm. wide, spreading-pubescent Ae. racemosa

Fruit with articles appressed-pubescent; leaflets 1.5-3 mm. wide, appressed-pubescent to glabrous.

Flowers 6-7 mm. long, the calyx about 3 mm. long . . . Ae. marginata var. marginata

Flowers 8-12 mm. long, the calyx 4-5 mm. long Ae. marginata var. grandiflora

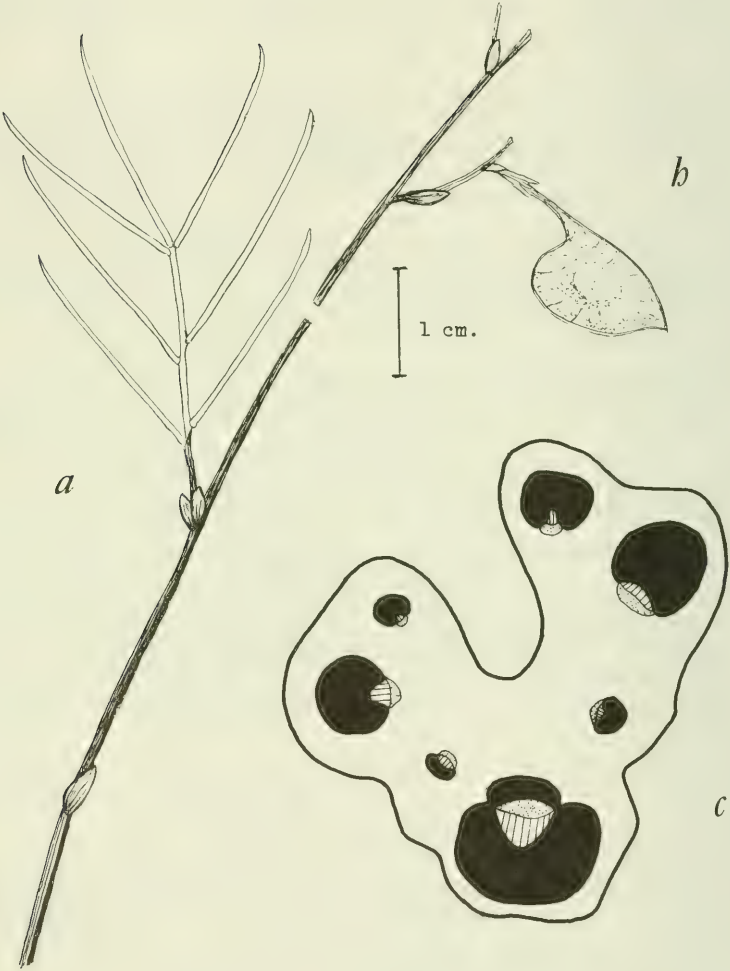
Length of leaflets 2-5 mm., the width 1-2 mm.

Fruit with stipe 4-5 mm. long, the articles 2.5-3.5 mm. in diameter Ae. paniculata

Fruit with stipe 2 mm. long or less.

Leaves about 1.5-2.5 cm. long, 15-24-foliolate Ae. leptostachya

Leaves to about 7 cm. long, 40-80-foliolate Ae. brevipes



AESCHYNOMENE IRWINII Rudd, sp. nov.

Ae. paucifolia Vog. affinis sed caulibus brevioribus, foliolibus paucioribus, aciformibus, leguminibus cum stipite longiore et articulis majoribus differt.

Suffrutescent perennial with numerous slender shoots arising from a deep, woody root; stems slender, erect, to about 25 cm. high, striate, sparsely appressed-pubescent; stipules linear-lanceolate, 2-3 mm. long and 1 mm. broad at the base, or less; leaves with axis 1-2 cm. long, subglabrous, 5-10-foliolate, the petiole 3-6 mm. long; leaflets subglabrous, acicular, about 12-25 mm. long and 0.5 mm. wide, canaliculate on the adaxial side; inflorescences few-flowered, terminal; bracts and bract-coles ovate to deltoid, acute, striate, sometimes ciliate, otherwise essentially glabrous, 1-2 mm. long and 1 mm. wide at the base; flowers 10-12 mm. long; calyx subglabrous, 5-6 mm. long, the teeth attenuate, 2-3 mm. long; petals not seen; fruit moderately pubescent with minute, crispate or spreading hairs, 1-articulate due to abortion of all but one ovule, the stipe about 8 mm. long, the fertile article compressed, 10-11 mm. long and 7-8 mm. wide; seeds not seen.

Type in the U. S. National Herbarium, No. 2486841, collected on campo slopes, Chapada dos Veadeiros ca. 13 km. N.W. of Veadeiros, Goiás, Brazil, elevation 1200 m., 20 October 1965, by H. S. Irwin, R. Souza, and R. Reis dos Santos (No. 9367). Isotypes at NY, etc.

The needle-like leaflets of this species, known only from the type collection, are unique in Aeschynomene although similar ones are found in species of other leguminous genera. In general characters it appears to be most closely related to those species of section Pleuronerviae that have leaflets with a marginal costa. In cross-section the leaflets of Ae. irwinii have been found to be slightly asymmetrical, further suggesting such a relationship. I am indebted to Dr. Edward S. Ayensu for sectioning a leaflet and providing the illustration (fig. 1, c).

Fig. 1 - Aeschynomene irwinii: a, portion of stem and leaf with leaflets expanded; b, portion of inflorescence with fruit; c, diagram of leaflet X-section with tissues indicated: white, parenchyma; black, sclerenchyma; stippled, phloem; lined, xylem.

AESCHYNOMENE NANA Glaziou ex Rudd, sp. nov.

Aeschynomene nana Glaziou, Bull. Soc. Bot. France 53. Mem. 3b: 132. 1906, nom. nud.

Ae. paucifolia Vog. affinis sed caulibus gracilibus, brevioribus, foliis foliolisque minoribus, floribus plerumque longioribus, leguminibus adpressipubescentibus differt.

Suffrutescent perennial with numerous slender shoots arising from a deep, woody root; stems slender, weak, to about 35 cm. high, striate, moderately appressed-pubescent with ascending hairs; stipules lanceolate, attenuate, essentially glabrous, 2-5 mm. long and 0.5-1 mm. broad at the base; leaves with axis moderately appressed-pubescent, 1-2.5 cm. long, about 10-20-foliolate, the petiole 1-2 mm. long; leaflets sparsely appressed-pubescent, glabrescent, semicordate, acute, 3-4 mm. long and about 1 mm. broad at the base, the costa marginal; inflorescences few-flowered, pseudo-terminal; bracts and bracteoles lanceolate, striate, 3-4.5 mm. long and about 1 mm. wide at the base, sometimes glandular-ciliate, otherwise subglabrous; flowers 10-13 mm. long; calyx sparsely appressed-pubescent, 5-6 mm. long, the teeth attenuate, about 3 mm. long, sometimes glandular-ciliate; petals light orange, drying to chocolate brown, the standard 10-13 mm. long and about 5 mm. wide, pubescent on the outer face, the wings and keel petals slightly shorter and narrower; fruit appressed-pubescent, 1-5-articulate, the stipe about 1-2 mm. long but sometimes apparently 4-5 mm. long due to abortion of basal articles, the normal articles semi-orbicular, compressed, about 5 mm. long and 3 mm. wide, the margin sometimes separating from the body of the article; seeds not seen.

Type: Glaziou 20921, "Entre As Brancas et le Rio Roncador", Goiás, Brazil (P). Isotypes at F,G,K,MG,NY; F.M.Neg. 27930 ex G.

Additional collections: BRAZIL: Goiás: "Burned-over campo, ca. 7 km. W. of Veadeiros, Irwin, Grear, Souza, & Reis dos Santos 12886 (NY,US).

Glaziou's original description of Ae. nana was merely "Plante naine, fl. jaunes. Décembre-Janvier. R."; hence the designation as nomen nudum.

The flowers on the recent collection are abnormal in that they show a tendency toward "doubling", a standard and some petaloid stamens being present in addition to the usual complement of petals.

AESCHYNOMENE PAUCIFOLIA Vog. Linnaea 12: 94. 1838.

Suffrutescent perennial with numerous shoots arising from a deep, woody root; stems erect, to about 2 m. high, striate, moderately patent-pubescent to velutinous or the pubescence subappressed; stipules lanceolate, attenuate, striate, sparsely pubescent, 3-8 mm. long and 0.5-2 mm. broad at the base; leaves with axis pubescent like the stem, 2.5-10 cm. long, about 22-60-foliolate, the petiole 1-3 mm. long; leaflets subglabrous or pubescent with patent or subappressed hairs, semicordate, acute, 2-10 mm. long and 1-3 mm. broad at the base, the costa marginal; inflorescences few-flowered, axillary and pseudoterminal, sometimes with a few glandular hairs; bracts and bracteoles ovate, acute, subglabrous, striate, 2-3 mm. long and 1-1.5 mm. wide; flowers 8-12 mm. long; calyx moderately pubescent, 3-5 mm. long, the teeth deltoid, attenuate, 1-3 mm. long; petals yellow to orange, sometimes with brownish markings, drying to an overall chocolate brown color, the standard 6-12 mm. long, 4-9 mm. wide, pubescent on the outer face, the wings and keel petals shorter and narrower; fruit minutely patent-pubescent, 1-5-articulate, the stipe about 1 mm. long but sometimes apparently longer due to abortion of basal articles, the normal articles semi-orbicular, compressed, about 5 mm. long and 4 mm. wide; mature seeds not seen.

Type: "Sellow leg. ad S. Antonio do Monte", Minas Gerais, Brazil (B, presumably destroyed; F.M.Neg. 2152 of type ? ex B).

Additional collections: BRAZIL: Minas Gerais: Between Santa Anna do Rio das Velhas and Rio Paranhya, north of Uberabá, Riedel 4268 (US). Between Santa Anna dos Alegres and Rio San Francisco, Riedel 2926 (C,E,GH). Lagoa Santa, Riedel 722 (US); Hoehne (Comm. Rondon) 6615 (R); Warming 3017 (C,F,US), 3018 (C). Between Lanhoso and Tejuco, Burchell 5741 (GH). Between Tejuco and Veraba-Legitima, Burchell 5773 (K). Santa Luzia, Mello Barretto 6052 (F). Brejo das Almas, Markgraf 3280 (R). Jaboticatubas, Mello Barretto 10355 (R); L.B.Smith 6934 (US). Tres Marias, Heringer 9492 in part (US). Varzea da Palma, Duarte 7479 (US). Goiás: Between Pé-da-Rocha and Rio Corumbá, Burchell 6061-2 (GH). Serra Dourada, 20 km. E. of Formoso, Dawson 14822 (US). Between Caiponia and Jataí, Irwin & Soderstrom 7001 (NY,US). Distrito Federal: Near Brasília, Irwin & Soderstrom 5085 (NY,US), 5750 (NY,US), 6248 (NY,US); Irwin, Souza, & Reis dos Santos 8210 (NY,US), 9629 (NY,US). Planaltina, Irwin et al. 8808 (NY,US). Sobradinho, Irwin et al. 10123 (NY,US). Corrego Jeriva, Irwin et al. 15373 (NY,US). Matto Grosso: Xavantina, Irwin & Soderstrom 6791 (NY,US).

A NEW VARIETY OF BAUHINIA COULTERI MACBRIDE FROM MEXICO

R.P.WUNDERLIN*

During the course of a study of the genus Bauhinia Section Bauhinia a variety of Bauhinia coulteri new to science was discovered. This variety is here described.

BAUHINIA COULTERI Macbride var. ARBORESCENS Wunderlin, var. nov. Pusilla arbor 5-6 m alta; rami juniores et inflorescentiae dense tomentosae; folia crispibus marginibus, infra dense tomentosae. Type: McVaugh 10351, ca. 80 km NE of Queretaro, Queretaro, Mexico (MO-holotype, TEX-isotype).

This variety is presently known only from the type collections.

This variety differs from Bauhinia coulteri var. coulteri in its arborescent habit, leaves tomentose below and with crisped margins, and the inflorescences and young branches densely tomentose.

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No. 3

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PROVANCHERIA

2

Mémoires de l'Herbier Louis-Marie
Faculté d'Agriculture, Université Laval

FLORA
OF THE
PRAIRIE PROVINCES

A HANDBOOK
TO THE FLORA OF THE PROVINCES OF
MANITOBA, SASKATCHEWAN AND ALBERTA

by

BERNARD BOIVIN

Herbier Louis-Marie, Université Laval
and Department of Agriculture, Ottawa



1867 1967

Part I
Pteroids, Ferns, Conifers and
Woody Dicopsids

PREFACE

We are pleased to present herewith in this condensed form a survey of the flora of Manitoba, Saskatchewan and Alberta as we know it. It is in a form which we hope will be especially adapted to use by the college student, yet remains convenient, in form and presentation, for use not only by the educated layman who may wish a key to the nature around him, but also by biologists, agronomists, botanists and other naturalists who may have the need for a handy guide to the vegetation of our area.

ENGLISH POPULAR NAMES have been restricted to those that appear to be vernacular and they are underlined only if they are known to be vernacular in Canada. FRENCH POPULAR NAMES follow in (brackets) and are underlined only if known to be vernacular in North America.

NATIVE AND INTRODUCED plants are distinguished as follows: names underundulated represent plants native in our area; names in CAPITALS represent plants introduced in our area.

SYNONYMY. Synonyms have been kept to the minimum necessary to establish the relation between this volume and the more important floras having a bearing in our region. The main ones considered are as follows: H.B. SPOTTON, A. COSENS and T.J. IVEY, Wild Plants of Canada, 1948; M.L. FERNALD, Gray's Manual of Botany 1950; H.A. GLEASON, New Britton and Brown Illustrated Flora, 3 vols, 1952; C.L. HITCHCOCK, A. CRONQUIST, M. OWNBEY, J.W. THOMPSON, Vascular Plants of the Pacific Northwest, 5 vols (4 published to-date) 1955-64; A.C. BUDD & K.F. BEST, Wild Plants of the Canadian Prairies, 1964; H.J. SCOGGAN, Flora of Manitoba, 1957; R.C. RUSSELL, G.F. LEDINGHAM, R.T. COUPLAND, An Annotated List of the Plants of Saskatchewan, 1954; A.J. BREITUNG, Annotated Catalogue of the Vascular Flora of Saskatchewan, 1957; E.H. MOSS, Flora of Alberta, 1959.

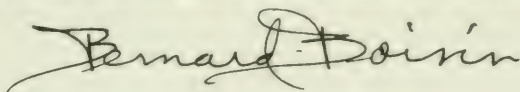
Two kinds of synonyms have been distinguished. True synonyms, such as Astragalus triphyllus Pursh in the synonymy of A. gilviflorus Sheldon, are followed by the correct author's name. Other synonyms, such as Astragalus hypoglottis AA. in the synonymy of A. danicus Retz., represent names based on misidentification of specimens or misinterpretation of types; note that the author's name has therefore been replaced by the abbreviation AA. All synonyms are underlined and encased in (brackets).

The local DISTRIBUTION of each taxon is followed by its general distribution in an abbreviated form. The geographical sequence used conforms to the list of abbreviations below. Two geographical abbreviations are connected by a hyphen when a Canadian distribution is continuous across the intervening provinces or territories, while a coma separating geographical units indicates a discontinuous Canadian distribution. Thus Q-BC indicates that a plant is known to occur in Quebec, Ontario, Manitoba, Saskatchewan, Alberta and British Columbia. Conversely Q-Man, Alta-BC indicates a plant with a similar distribution, but lacking in Saskatchewan.

A distribution is enclosed in (brackets) if we have not checked it personally but are quoting other botanists. No brackets are used when we have been able to confirm the distribution given herewith. Partially confirmed distributions are accordingly given partially outside, partially inside brackets. Prior to 1963 our recording of verified distributions was unfortunately somewhat spotty, hence some of the confirmed distributions will fall short of our actual herbarium studies and annotations.

A brief review of 22 major families and other groups of plants occurs at the beginning of the Herbaceous Dicots. This review may be especially useful to the beginner. It may also serve as an outline for a practical course in Plant Classification at the elementary level.

In so far as we have been able to check them, we have included in this text only such taxa as we have been able to recognize as discrete biological entities. All others have been relegated to synonymy, along with all minor morphological segregates that seemed of no particular significance. We have acted on the basis that first and foremost a species should be morphologically discontinuous from its closest relatives. And this discontinuity should be such as to be readily recognized by a good amateur or biologist (ecologist, forester, agrep, etc.), given the usual equipment and a reasonable amount of previous experience or training. One should not need to send for a specialist for every other Carex or Crataegus. Taxonomy is not an esoteric science, but an everyday tool of biologists, amateurs and just plain interested and intellectually curious people. We consider that the classification of Vascular Plants should remain within reach of such people and that the species should be the natural unit of knowledge. May we hope that the result of our efforts does not fall too far short of our objective.



Bernard Boivin
Herbier Louis-Marie
Université Laval, Québec

September 1966*

*

A few additions and minor revisions have been incorporated to this text until late spring and summer 1967.

THANKS

Our field work in the Prairie Provinces cover 8 seasons from 1946 (with the National Museum) to 1960 (with the Department of Agriculture) and we have had an opportunity to examine or borrow a large proportion of the relevant material preserved in institutional collections. The general western collections at the Department of Agriculture (DAO) and at the National Museum (CAN) are rather complete and have been extensively reviewed. The general but less extensive collections at the Faculty of Agriculture at Laval (QFA) has also been reviewed nearly in full. Another extensive and important collection is preserved at the Gray Herbarium (HUH) but has been examined in part only. We have borrowed large blocks from some of the local herbaria, namely from the University of Saskatchewan, (SASK), the University of Regina, (REG), the Experimental Farm at Swift Current (SCS) and the Research Station at Saskatoon (SASKP). We have also leafed through part of the collections at the University of ALBERTA (ALTA), the University of Manitoba (WIN) and the Experimental Farm at Brandon. At one time or another we have received selected loans from a large number of institutions, including every one of the above. To all the institutions who have thus placed their facilities at our disposal, our most grateful thanks for their unfailing cooperation. We wish to extend similar thanks to the many colleagues who have helped us with information and suggestions and similarly to the numerous amateurs who have kept sending in a steady stream of information and of duplicates of their more important discoveries. Many of these amateurs have also published important papers and have thus made a major contribution of their own. Such are: A.J. Breitung (McKague, Cypress Hills, Waterton), Dr. G.H. Turner (Fort Saskatchewan), J.H. Hudson (Mortlach), and J.P. Bernard (Otterburne). The latter is now my assistant and deserves special thanks for his substantial contribution to the preparation of this text, collaborating on the preparation of the glossary, helping to check the distributions and, generally speaking, shouldering a large proportion of the tasks involved in preparing this manuscript for publication.

ABBREVIATIONS

AA. Authors, American Author.	K Keewatin District
sphalm. By mistake; abbreviation of the latin sphalmate.	Mack Mackenzie District
m Meter, about 4 inches longer than a yard.	Y Yukon
dm Decimeter; about 4 inches.	Aka Alaska
cm Centimeter; about 2/5 inch.	L Labrador
mm Millimeter; about 1/25 inch.	NF Newfoundland
ssp. Subspecies	SPM Saint-Pierre & Miquelon
var. Variety	NS Nova Scotia
f. Form	PEI Prince Edward Island
cv. Cultivar	NB New Brunswick
n North	Q Quebec
s South	O Ontario
e East	Man Manitoba
w West	S Saskatchewan
ne Northeast	Alta Alberta
nw Northwest	BC British Columbia
se Southeast	US United States of America
sw Southwest	CA Central America, (including Mexico and the West Indies)
c Central	SA South America
G Greenland	Eur Eurasia
F Franklin District	Afr Africa
	Oc Oceania

SEQUENCE OF FAMILIES AND GENERA

The sequences of FAMILIES is adapted from the Bull. Soc. Bot. Fr. 103: 490-505. 1956. And the sequence of GENERA within a family is adapted from Dalla Torre & Harms, Genera Siphonogamarum 1900-1907 for the Conifers and Flowering Plants, from E.B. Copeland, Genera Filicum 1947, for the Ferns.

At least as far as the families are concerned, the basic principle of the sequence is the following evolutionary hypothesis.

Evolution does not proceed by the creation or production of brand new structures -- evolution proceeds by fixation, modification, specialization, differentiation or reduction of preexisting structures. Structures which appear to be new, those which constitute a progress, those which give a species, or other taxon, a special advantage in the struggle for life, which enable a species to occupy a previously empty niche or to displace an earlier occupant, such structures are always evolved step by step from preexisting structures.

This evolution step by step, or microbematic (=little steps) evolution, is familiar to our generation by many well known instances such as the creation of new horticultural varieties or the appearance of new and resistant races of pests and diseases following the wide application of a chemical or biological controls.

In practice this evolutionary concept leads to the following observations in so far as the Vascular Plants are concerned.

- 1- Free structures are more primitive than fused structures.
 - 2- Similar structures are more primitive than differentiated structures.
 - 3- The type with numerous parts is more primitive than one with fewer parts or with parts fixed in number, which in turn is more primitive than the type without the same parts, provided this absence is the result of reduction.
 - 4- Alternate or spiral parts is a more primitive condition than opposite or verticillate, as the latter seems to result from some internodes failing to develop.
 - 5- Open venation is more primitive than reticulate venation.
 - 6- Indefinite and indeterminate growth is more primitive than definite or determinate growth.
 - 7- The terminal or solitary flower is more primitive than the inflorescence and the open inflorescence is more primitive than a closed inflorescence, such as a capitulum, cyathium, catkin, etc., which has come to function more or less as a single flower.
 - 8- The free prothallium (alternation of generations) is a more primitive type than the type where the spores develop and produce a seed without leaving the mother-plant.
 - 9- Dichotomous branching is more primitive than sympodial or monopodial or verticillate branching.
 - 10- The type with scattered and similar sporophylls is more primitive than the type with sporophylls borne in a spike, or sexually differentiated, etc.
 - 11- The type with the fronds all similar is more primitive than the type with the fronds differentiated into sterile and fertile ones.
 - 12- Radial symmetry is generally more primitive than the dorsiventral or bilateral or zygomorphic type.
 - 13- The perennial plant is more primitive than the biennial or the annual.
 - 14- The woody plant is generally more primitive than its herbaceous relative.
 - 15- The terrestrial and autonomous type is more primitive than its aquatic, or epiphytic, or saprophytic, or climbing, or parasitic, or symbiotic relative.
- Finally, evolution tends to become irreversible as a type becomes further and further reduced, more and more specialized.

KEYS TO GENERA AND SPECIES

Keys are a modern feature of floras, but their development is a gradual one. In floras of two centuries ago there were no keys, but the species of a genus were often arranged in a graded sequence so that the successive diagnostic names could be used somewhat like an unindented key. Synoptical diagrams of the classification of a whole flora were often offered as a help to the user. Larger genera were often subdivided by means of sub-headings. The latter were easy to locate in the text as they

were usually quite symmetrical visually and may be further identified by use of various symbols such as asterisks, daggers, dashes, etc. As genera became larger, more elaborate systems of subheadings were developed. And when these subheadings were brought together in a synoptic table at the beginning of a genus, a key was born. As keys were further developed, they tended to become dichotomous. And when ease in identification became the primary objective of a key, the natural key which gave a synoptical view of a genus tended to give way to the artificial key in which diagnostic characters are selected solely for their ease of use and efficiency in identification.

We have further developed and refined our keys along the lines of current trends. Our keys are purely artificial and built strictly as an aid to identification; more convenient characters are given the preference over more fundamental ones that might better illustrate the essential differences between taxa. Keys are strictly dichotomous and indented, with the pairs of indentations identified by the same letter in the margin. This is the type of structure which produces the easiest keys to use. The number of words and concepts used in each indentation has been kept low on purpose so that the reader may keep the contents of the first indentation clearly in mind while he reads the second indentation. Keys that are overloaded with ifs and whens or too many characters may be more accurate because they may take care of all the contingencies, but the gain in accuracy is all too often at the expense of comprehension.

Visual symmetry is a valuable feature of a good key; it enables the eye to discover quickly and follow easily a particular path of identification. The visual symmetry is here provided primarily by the use of indentations and identifying letters. This has freed us from the need for verbal symmetry and we have therefore eliminated some of the repetitiveness usually found in the second member of a pair of indentations. The resulting brevity will facilitate the task of the mind trying to grasp simultaneously the contents of a pair of indentations. We have also been able to emphasize the diagnostic differences in our keys at the expense of verbal symmetry. Further we have often emphasized the direction of the differences between two taxa or two groups of taxa; it is thus quite often possible to state in only one or two words the essential nature of the difference between two entities.

As we progressed in the preparation of this text we noticed that it was possible to grasp an overall view of a key as long as its terms were not too numerous. This has led us to try to subdivide each larger genus into groups of mostly 6-10 species each. When a large key is thus broken in smaller units, it is possible to retain an overall view of the key to a much larger number of species or genera.

For the sake of brevity the characters used in a key are most often not repeated in descriptions of species, genera and larger groups. Further brevity has been achieved quite often by merely stating how a particular taxon differs from a closely

related one, thus obviating the need to repeat such characters as they may have in common. While a standard sequence is generally followed in describing the successive parts of a plant, more important features are often stated first, especially if they have strong diagnostic value, and especially if these characters were not used in the key.

FLORA OF THE PRAIRIE PROVINCES

Embranchement: TRACHAEOPHYTA

Plants with vascular tissues and, usually, recognizable root, stem and leaves.

- a. Reproduction by spores borne on leaves or sporophylls.
 - b. Sporangia borne dorsally on peltate sporophylls.
 - Branches, leaves and sporophylls verticillate Division 2. Equisophyta p. 14
 - bb. No peltate sporophylls. Branches, leaves and sporophylls usually alternate.
 - c. Sporangia ventral, leaves usually small and simple Division 1. Lycophyta p. 9
 - cc. Sporangia dorsal or naked on specialized branches; leaves (=fronds) usually large and variously divided.
 - Sub-division 1. Pterophytina p. 18
- aa. Reproduction by seeds borne in cones or flowers.
 - d. Seeds naked, borne in cones; woody plants with leaves usually persistent and mostly needle-like Sub-division 2. Gymnophytina p. 32
 - dd. Seeds wrapped in a carpel, borne in flowers, leaves various
 - Sub-division 3. Angiophytina p. 39

Division 1. LYCOPHYTA

Sporangia solitary and subaxillary on the ventral side of a bract or leaf (=sporophyll).

- a. Submerged tufted aquatics from a fleshy bilobed corm Class 2. Isopsida p. 14
- aa. Normally terrestrial herbs with clearly distinct stem (and branches) Class 1. Lycopsida p. 9

Class 1. LYCOPSIDA

Growing point terminal. Foliar appendages differentiated into leaves and sporophylls, the latter usually disposed into clearly recognizable spikes.

- a. Spike cylindrical; spores very small and quite numerous 1. Lycopodiaceae
- aa. Spike quadrangular, the sporophylls being disposed in 4 vertical rows; some of the spores much larger and only 4 to a sporangium
 - 2. Selaginellaceae

Order 1. LYCOPODIALES

Single family

1. LYCOPODIACEAE (CLUB-MOSS FAMILY)

Sporangia, spores and prothallia not sexually differentiated. Sporangia and leaves without ligules.

1. LYCOPODIUM L.

Herbs dichotomously divided. Leaves small and simple, disposed on 4 ranks or more, persistent.

- a. Bearing rings of bulblets. No spike 1. L. Selago
- aa. No bulblets. Sporophylls in a terminal spike.
 - b. No rhizome. Terminal spike barely differentiated from the foliage 2. L. inundatum
 - bb. Elongated rhizomes present. Spikes strongly differentiated from the foliage.
 - c. Spike borne on a long peduncle.
 - d. Leaves in about 8 rows and with a long terminal seta 4. L. clavatum
 - dd. Branchlets flattened; leaves partly adnate and in 4 rows 8. L. complanatum
 - cc. Spikes sessile or nearly so.
 - e. Leaves in 6 or more rows, the free portion of each leaf 3 mm long or more.
 - f. Erect shoot with a strictly dichotomous branching; branches few 3. L. annotinum
 - ff. Erect shoot with a distinct main stem; branches numerous 5. L. obscurum
 - ee. Leaves in 4-(5) rows, much adnate, the free portion not more than 3 mm long.
 - g. Leaves of the various rows quite similar 6. L. sabinifolium
 - gg. Leaves strongly differentiated, those of the dorsal row trowel-shaped 7. L. alpinum

1. L. Selago L. var. Selago -- Rat's Tail (Sélagine, Herbe aux pores) -- No rhizome, but tufted. Strictly dichotomous with all branches reaching the same level. Rings of bulblets, sporophylls and leaves in alternating groups along the branches. Alpine and subarctic habitats, usually half buried in Sphagnum. -- G, K-Aka, L-SPM, NS, NB-BC, US, (CA, SA), Eur -- F. appressum (Desv.) Gelert -- Leaves erect and tightly appressed to the stem. Hudson Bay region. -- G-Aka, L-SPM, NS, Q-nMan, swAlta-seBC, (US), Eur.

The widely distributed var. Selago has the leaves ± 1 mm wide, or slightly more, and straight. Around the Pacific Ocean it grades into, and is largely replaced by, the more delicate var. Miyoshianum Makino with leaves ± 0.05 mm wide, \pm incurved

beyond the middle, and mostly spreading to descending. Reports of L. porophyllum Lloyd & Und. from Western Canada by Rydberg 1932, Macoun 1890, and others are likely to be based on various forms of L. Selago. However, we have not yet met with any specimen so named from Alberta. See Boivin 1966. Reports by Macoun 1890 of L. lucidulum Mx. from Laggan and B.C. have not been traced yet but are held as highly dubious and likely to be based on variants of L. Selago.

2. L. inundatum L. var. inundatum -- No rhizome, but producing a new bulb at the end of the season. Dichotomously divided into a creeping sterile shoot and an erect fertile one. Spike terminal, barely distinct. Sporophylls slightly longer than the leaves. Wet spots subject to spring flooding, especially in bogs. Lake Windrum. -- Aka, L-SPM, NS-J, nS, BC, US, Eur.

3. L. annotinum L. (var. acrifolium Fern.) -- Long superficial leafy rhizome present. Erect shoot dichotomously divided into a few erect branches. Leaves spreading to descending, usually serrulate. Spike solitary and sessile. Dense coniferous woods. -- K-Aka, L-SPM, NS-BC, US, Eur -- F. pungens (Desv.) M.P. Pors. (var. alpestre Hartm.) -- Erect shoots in denser tufts. Leaves strongly ascending to appressed, those of the fertile branches shorter, less than 5 mm long. Open, alpine or subarctic habitats. -- G-Aka, L-SPM, NS-BC, US, Eur.

Var. acrifolium is sporadic in its distribution and appears to be a morphological extreme with entire leaves. F. pungens appears to be an ecological variation and is geographically restricted to the same extent that its habitat is also restricted.

4. L. clavatum L. var. clavatum (var. megastachyon Fern. & Bissell) -- Clubmoss, Staghorn-Moss (Courants verts) -- Superficial leafy rhizome present. Leaf ending in a long conspicuous seta, these gathered in white to rusty tufts at the end of shoots. Spike long-peduncled, the peduncle bracteolate and often branched. Dry woods, usually coniferous woods. -- Aka, L-SPM, NS-BC, US, Eur. -- F. monostachyon (Desv.) Clute -- Shorter spike on a short peduncle, the latter usually shorter than the spike. Leaves shorter and more strongly incurved. More open and subalpine to subarctic habitats. -- G, K-Aka, L-NF, Q-(O)-Man-BC, (US), Eur.

The setae are commonly deciduous around the 5th or 6th year. On the Pacific slope the typical variety is partly replaced by a var. integerrimum with setae deciduous the very first year. The latter has also been reported from Wisconsin, but we have not yet been able to confirm this report. F. monostachyon appears to be an ecological variant essentially comparable to the f. pungens of the previous species. Other variations based on the size and number of spikes per peduncle do not seem to be in any way significant.

5. L. obscurum L. (f. exsertum Vict., var. dendroideum (Mx.) D.C. Eaton) -- Ground-Spruce, Ground-Pine (Petits Pins) -- Rhizome deeply buried. Erect shoots very branchy and looking like little trees, with a solitary or a few terminal sessile spi-

kes. Semi-open coniferous woods. -- (K)-Mack-Aka, L-SPM, NS-BC, US, (Eur).

A barely distinct form of sunny places is often called var. dendroideum, but a better name would seem to be f. exsertum as it hardly rates as a variety.

6. L. sabinifolium W. var. sitchense (Rupr.) Fern. (L. sitchense Rupr.) -- Ground-Fir -- Rhizome nearly superficial. Leaves partly adnate, this species being thus intermediate between the previous numbers with free leaves and the following ones strongly adnate. Sterile branches strongly ascending and flattened, but with those of the ventral and dorsal rows quite alike. Spike usually solitary, sessile. Acid soils from lake Hasbala westward. -- Aka, nS-BC, US, (Eur).

Our variety has dimorphic erect branches, the fertile ones being 2-3 times longer (exclusive of the sessile spike) than the sterile ones. The more eastern typical variety has subequal branches, but the spike is usually pedunculate. This morphological distinction is at variance with the usual treatment in current manuals and all specimens and reports of var. sabinifolium from Howard and elsewhere in our area have been revised accordingly. See Boivin 1966.

7. L. alpinum L. -- Similar to the following. Leaves of the ventral row strongly differentiated, shaped like a small trowel. Spike solitary and sessile. Light woods near timberline; Rockies -- G, K-Aka, L, Q, wAlta-BC, (US), Eur.

8. L. complanatum L. var. complanatum -- Ground-Cedar -- Rhizome deeply buried. Branches strongly flattened, much paler below, elongating each year, the annual growth being termed an innovation. The innovations separated by constrictions. The lower branches with (2)-3-4-(5) innovations. Leaves strongly adnate, those of the lower rank much smaller. Spikes long peduncled, mostly solitary. Dry woods, usually coniferous, and dry semi-open places. -- G, K-Aka, L-SPM, NS-BC, US, Eur. -- Var. Habereri (House) Boivin (var. Gartonis Boivin; L. tristachyum AA.) -- Usually longer and with more open branching. Most branches innovating but only once. Spikes usually geminate. Rhizome near the surface. Coniferous woods on light soils. -- sMack, sQ-nS, neUS, (Eur).

In some herbaria many specimens of L. complanatum have recently been revised to various hybrid combinations. We find these hybrids to be unconvincing on morphological ground and also because too many of them were collected way outside the range of one of the putative parents. Nearly all these so-called hybrids appear to fall within the normal range of variation of L. complanatum or its var. Habereri.

Order 2. SELAGINELLALES

Single family

2. SELAGINELLACEAE (SPIKEMOSS FAMILY)

Like small Club-Mosses, but with the spores sexually differentiated, the megaspore larger and 4 together in a sporangium.

1. SELAGINELLA Beauvois SPIKEMOSS

Small herbs, weakly rooted. Branching dichotomous. Spikes terminal and sessile.

- a. Leaves merely acute, not bristle-tipped 1. S. selaginoides
- aa. Leaves bristle-tipped.
 - b. Glauous, loosely tufted 4. S. Wallacei
 - bb. Green, densely creeping.
 - c. Setae about 0.5 mm long 2. S. rupestris
 - cc. Setae 1.0 mm long or more 3. S. densa

1. S. selaginoides (L.) Link -- Very filmy and easily confused with a Hepatic, which it resembles. Two-toned. The sterile shoots dark green and creeping; the fertile one erect and straw-green. Leaves remotely dentate. Sporophylls loosely spreading. Creeping among the mosses in slightly disturbed places in bogs. -- G, K-Aka, L-SPM, NS, NB-BC, US, Eur.

2. S. rupestris (L.) Spring -- Small perennial resembling a small Lycopodium. Sterile branches about 1 cm high; the fertile ones (2)-3-(4) cm high. Leaves small and closely imbricated, ending in a seta 1 mm long or less. Forms a loose carpet on rocks or in dry Pine woods. -- G, NS, NB-neAlta, US, Eur.

Reports from southwestern Manitoba proved to be based on S. densa.

3. S. densa Rydb. var. densa -- A prairie species quite similar to the preceeding and often confused with it. Sterile branches about 4 mm high, the fertile ones 1.5-2.5 cm high. Terminal setae 1 mm long or more, forming conspicuous tufts at the end of branches. Sporophylls ciliate to the tip. Forming compact flabelliform carpets on dry ground. Very common prairie species, but usually hidden and inconspicuous. -- swMan-seBC, US -- Var. scopulorum (Maxon) Tryon (var. Standleyi (Maxon) Tryon; S. scopulorum (Maxon) -- Sporophylls eciliate above the middle. Dry alpine habitats. -- (se Aka), swAlta-BC, US, (CA).

4. S. Wallacei Hier. -- Foliage somewhat glaucous. Similar to the previous two and often confused with them. Much larger and more loosely tufted and branched, the main shoots up to 10 cm long. Leaves and sporophylls minutely ciliate towards the apex, but eciliate or nearly so towards the base. Setae short, inconspicuous, less than 0.5 mm long. Dry, rocky mountain slopes: Waterton. -- swAlta-BC, US.

Class 2. ISOPSIDA

A single order, family and genus.

Order 3. ISOETALES -- 3. ISOËTACEAE (QUILLWORT FAMILY)

1. ISOËTES L.

QUILLWORT

Tufted aquatic from a bilobed corm. All leaves bear a ventral sporangium with a small ligule above the sporangium. Spores of two kinds, the female ones much larger and termed "megaspores".

- a. Megaspores covered with spinulose projections about as high as the equatorial and commissural ridges...

..... 1. I. echinospora

- aa. Smaller and merely covered with tubercules which are about as high as wide and much lower than

the ridges 2. I. Bolanderi

1. I. echinospora Durieu var. Braunii (Durieu) Eng. (S. muricata AA.) -- Leaves soft, filiform, arched, entire, up to 15 cm long, bulbous at base. The bulbous part is hollowed out and contains a sporangium. Megaspores spinulose, about 1/2 a millimeter across. A bottom dweller in shallow waters of lakes. -- G, K-Aka, L-SPM, NS-BC, US.

Northeastward it gives way to var. Savilei Boivin, a smaller plant with smaller megaspores, about 1/3 mm across, varying from 300 to 400 μ . Our american varieties form the ssp. muricata (Durieu) L  ve & L  ve, characterized by the presence of stomata. These will be made conspicuous by the action of iodine as the guard cells accumulate starch. Stomata are absent in ssp. echinospora.

2. I. Bolanderi Eng. var. Bolanderi -- Leaves often longer, up to 25 cm long. Megaspores merely tuberculate and smaller, about 1/3 mm across. Alpine lakes in Waterton. -- swAlta-(BC), US.

In the southwestern USA occurs a var. pygmaea Clute much smaller, 2.5 cm high or less, and with megaspores almost smooth.

Division 2. EQUISOPHYTA

A single class, order, family and genus.

Class 3. EQUISOPSIDA -- Order 4. EQUISETALES

4. EQUISETACEAE (HORSETAIL FAMILY)

1. EQUISETUM L.

HORSETAIL

Herbs, easily coming apart at the nodes. Leaves verticillate, small and fused together into a sheath at each node. Branches verticillate and alternating with the leaves. Sporophylls peltate and verticillate in a terminal spike. Sporangia dorsal.

- a. Stems all green and simple.

Iso  tes

- b. Stems wall paper-thin and easily crushed... 9. E. fluviatile
- bb. Stem stiff with thick wall and smaller central cavity.
 - c. Small plants; sheath with 3 teeth only 4. E. scirpoides
 - cc. Larger; teeth much more numerous.
 - d. Teeth persistent; stem up to 2.5 mm thick 3. E. variegatum
 - dd. Teeth deciduous; stem usually much larger.
 - e. Stems annual; sheath with a ring of brown dots 1. E. laevigatum
 - ee. Stems biennial; sheath soon developing two black rings... 2. E. hyemale
 - aa. Stems branched, at least the sterile ones; fertile stems sometimes yellow and simple.
 - f. Branches ramified; sheath two-toned, green at base, brown at top..... 7. E. sylvaticum
 - ff. Branches normally simple; sheath green only.
 - g. Lowermost internode on each branch longer than the corresponding sheath on the stem 5. E. arvense
 - gg. Lowermost internode on each branch as long as or shorter than the corresponding sheath on the stem.
 - h. Sheath of the branches 3-toothed..6. E. pratense
 - hh. With (4)-5-(6) teeth.
 - i. Stem-sheaths with 6-8 teeth...8. E. palustre
 - ii. With 10-30 teeth9. E. fluviatile

1. E. laevigatum Braun (E. hyemale L. var. intermedium A.A. Eaton; E. kansanum Schaffner; E. intermedium (A.A. Eaton) Rydb.) -- (Préle) -- About 1 mm high, often producing tufts of short stems. Stem simple, pale green, not overwintering. Sheath slightly constricted at base, about 2-3 times longer than wide at base and slightly flaring. Sporesis mostly in mid-summer. Open places, often hilly and sandy. -- Q-BC, US, (CA).

Quite easily recognized by its pale green colour and the ring on the sheath reduced to a row of brown dots. New shoots will produce a spike the very first year and sporesis takes place around the middle of summer. The stems do not persist but are regularly winter-killed. The base of an old stem will often generate a tuft of very thin stems which are usually sterile and may vary from straight to flexuous, thus resembling E. variegatum in habit. Yet these thin stems should be readily recognized by the unique type of sheath of E. laevigatum. The base of an old stem will sometimes persist into a second summer; it will then develop sets of rings that may somewhat resemble those of E. hyemale. Most of our personal collections of E. laevigatum will illustrate its usual dimorphism in stem size and shape.

In our field experience this species and the next two are

quite sharply distinct and never hybridize. However, in the herbarium, the distinction is not always so obvious and a fair proportion of specimens will seem to be more or less intermediate. These atypical specimens are variously treated as varieties or species or as interspecific hybrids. Mostly they will be found filed under one or the other of the following names or formulae.

E. hyemale X laevigatum = E. hyemale var. intermedium A.A. Eaton = E. Ferrissii Clute. We have examined quite a few specimens identified by Hauke to E. Ferrissii and we are not satisfied that they show morphological evidence for their hybrid status; nearly all specimens seemed to fall well within the normal range of variation of E. laevigatum and have been so revised. According to the map published, the range of E. Ferrissii extends a long way beyond the range of one of the putative parents, certainly not a feature to be normally expected in a hybrid.

E. laevigatum X variegatum = E. variegatum var. Nelsonii A.A. Eaton = E. Nelsonii (A.A. Eaton) Schaffner. Under those names one finds mostly small specimens of E. laevigatum. E. Nelsonii is treated as a hybrid by Hauke 1963 and, as in the case of E. Ferrissii, his distribution map shows E. Nelsonii extending well beyond the range of one of its putative parents. The morphological evidence of hybridity is not convincing.

E. hyemale X variegatum = E. hyemale var. Jesupii (A.A. Eaton) Vict. = E. trachyodon AA. Specimens filed under those names are usually small individuals of E. hyemale. These seem to be sporadic in the range of the species, being perhaps more frequent northward. As in the two cases previous, the morphological evidence for hybridity is not convincing.

2. E. hyemale L. var. affine (Eng.) A.A. Eaton (var. elatum (Eng.) A.A. Eaton, var. pseudohyemale (Farw.) Morton, var. robustum (A.Br.) A.A. Eaton, E. affine Eng.; E. prealtum Raf.) -- Scouring Rush (Prêle des tourneurs) -- Stem dark green, commonly 1 m high, simple, overwintering. Sheath cylindric, short, up to 1 1/2 times as long as large, soon developing two black rings separated by a gray zone. Sporesis sometimes in the fall of the first year, most often in the spring of the second year. Humid and sandy places, most often on embankments. -- Mack-Aka, (NF), NS, NB-BC, US, (Eur).

The internodes are ridged longitudinally and in our american var. affine the ridges are crested by a single row of minute and inconspicuous siliceous tubercles. In the eurasian var. hyemale the tubercles form a double row on the crest of each ridge. This difference is not always very clear, but is a valid one if the two varieties are treated as populations.

The stems of this species are very dark green and, like E. laevigatum, they are dimorphic although not in the same manner. First year stems are lighter in colour and usually sterile, but they may produce toward the middle of the summer a spike which will achieve sporesis in the fall. The second year the stems will have appreciably darkened and most of them will produce a spike which will mature before the end of spring. Generally the

stem will be frost-killed during the second winter, but an occasion it may survive for a third season and will then produce short fertile branches (=f. polystachyum Prager). This branching and production of more than one spike may also appear during the second summer on stems that may have suffered during the first winter some frost damage affecting only the summit of the stem. Our collection no. 13 611 from Pend-d'Oreille Lake in Idaho was meant to illustrate the stem dimorphism of this species.

Such individuals as may be more luxuriant, being taller and coarser, are often named var. californicum Milde or var. elatum or var. robustum. These forms are occasional in the range of the species and hardly deserve taxonomic rank, even if they seem to be somewhat more frequent southward.

3. E. variegatum Schleicher -- Similar to the preceeding, but generally smaller. Stems simple, annual, up to 4 dm high, up to 2.5 mm thick. Sheath with a single brown or black ring and persistent teeth. Shores and wet coniferous woods. -- G-Aka, L-NF, (SPM), NS, NB-BC, US, Eur.

As with the first two species, extreme forms have received names. Var. alaskanum A.A. Eaton will designate the more vigorous plants while var. anceps Milde, or better f. anceps (Milde) Braun, will refer to those with more delicate stems.

4. E. scirpoides Mx. -- Smallest and forming a dark, dense, tangled carpet on the forest floor. Stems only 5-12 cm long, dark green, simple, flexuous and without a central cavity. Sheath with only 3 teeth. Mostly coniferous woods. -- G-Aka, L-SPM, NS-BC, US, Eur.

5. E. arvense L. (var. boreale (Bong.) Led.) -- Horsetail (Queue de renard) -- Stems of two kinds, the fertile ones simple, very early, yellow and soon disappearing. The sterile ones appearing a little later, with simple solid branches. Sheaths of the branches with 3-4 lanceolate teeth 1 mm long or more. Everywhere, especially in wet places. -- G, K-Aka, L-NF-(SPM), NS-BC, US, Eur. Afr.

A most plastic species with scores of named forms and varieties. The most popular one is var. boreale in which the branches are essentially trigonous while they are tetragonous in var. arvense. The first is mostly found in shaded places and the second occurs mainly in more sunny habitats. Apparently these varieties are only minor ecological forms.

6. E. pratense Ehrh. -- Meadow-Horsetail -- Stems of two kinds, the fertile ones very rare, appearing in early summer, pale green, branched or soon branching. Sterile stems with simple branches spreading. Sheaths of the branches with 3 deltoid teeth less than 1 mm long. Dense woods near water. -- Mack-Aka, NF, NS, NB-BC, US, Eur.

7. E. sylvaticum L. var. multiramosum (Fern.) Wherry (var. pauciramosum AA.) -- Bottle-Brush -- Branches flexuous and ramified. Stem finely pubescent. Shoots of two kinds, appearing at the same time, the fertile ones with the longest branches uppermost, the sterile ones with the longest branches lowermost. Sheaths of the stem with large russet teeth fused in 3 or 4 groups.

Spores in late spring. Woods, especially coniferous woods. -- G, K-Aka, L-SPM, NS-BC, US.

Typically var. multiramum has smooth branches while the eurasian var. sylvaticum is minutely glandular-scabrous along the ridges of the branches. As pointed out by Fassett 1944 and as we have been able to check in the field and in the herbarium, the distinction is a statistical one and is valid only if the two varieties are treated as populations on a continental scale. It is not difficult to find in the range of one variety, especially in the northern part of the range, a specimen that could pass as typical of the other variety.

In Ungava and eastward one may find another variety, var. pauciramum Milde, with much reduced branching. Many authors do not distinguish this entity, in which case the correct name for var. multiramum becomes var. pauciramum because the latter antedates the former by nearly a century. Hence all reports of var. pauciramum west and south of Ungava and Newfoundland should be interpreted as applying to var. multiramum.

8. E. palustre L. var. simplicissimum Braun -- Bog-Nut -- Sterile and fertile shoots rather alike and normally branched, the branches rather coarse and nearly as thick as the stem. Lowest branches internode very short, with a central cavity and with sheath bearing (4)-5-(6) teeth. Shores of larger rivers. -- Mack-Aka, L-NF, NB-BC, US.

The eurasian var. palustre bears branches with their middle sheaths cut into teeth only (0.5)-0.8-1.2-(1.5) mm long. Our american phase is weakly differentiated by a number of statistical differences of which the strongest is found in the length of the teeth of the middle sheaths of the branches; these are (1.0)-1.5-2.5-(3.0) mm long in american plants. The latter was first distinguished as var. americanum Vict. 1927 but there are three earlier names available of which var. simplicissimum Braun is the earliest and correct name as pointed out by Boivin 1951.

9. E. fluviatile L. (E. limosum L.) -- Pipes (Pipes) -- Stem with the largest central cavity and the thinnest walls, thus very easily flattened. Very variable, simple to much branched. Sterile stems long attenuate at tip, otherwise similar to the fertile ones. Stem sheaths short, with numerous small and strongly blackened teeth. Branches hollow. Wet spots and shallows. -- K-Aka, L-SPM, NS-BC, US, Eur.

Division 3. PTEROPHYTA

Reproducing by seeds or by spores borne in marginal or dorsal sporangia. Leaf (or frond) usually well developed and rather large.

Sub-division 1. PTEROPHYTINA

Herbs with rather large fronds which are usually much divided. Venation usually more or less dichotomous. Sporangia borne on the back of fronds or at the margin of specialized shoots. A single class.

Class 4. PTEROPSIDA

- a. Frond dichotomously divided into a leafy branch and a fertile branch; sporangia not clustered in sori, but more or less scattered, rather large and individually noticeable and usually sessile.
..... Order 5. Ophioglossales
- aa. Frond usually pinnately divided; sporangia small, submicroscopic, usually stipitate and aggregated in discrete sori Order 6. Filicales p. 21

Order 5. OPHIOGLOSSALES

Sporangia marginal, scattered, often sessile or nearly so. Frond divided in such a way as to look like a stem with a terminal inoprescence and a single cauline or basal leaf.

5. OPHIOGLOSSACEAE (ADDER'S TONGUE FAMILY)

A single genus with us.

1. BOTRYCHUM Swartz

Fertile segment a terminal panicle. Sterile segment \pm divided.

- a. Sterile segment triangular, peduncled and inserted near the base of scape.
 - b. Sterile segment ternately compound... 1. B. multifidum
 - bb. Sterile segment simple to trifoliate ... 4. B. simplex
- aa. Sterile segment sessile to short-peduncled, inserted toward the middle or upper part of the stipe.
 - c. Sterile segment 1-4 dm wide 7. B. virginianum
 - cc. Sterile segment smaller.
 - d. Sterile segment \pm lanceolate.
 - e. Pinnae broadly flabelliform..... 2. B. Lunaria
 - ee. Pinnae ovate or obovate.
 - f. Pinnae obovate, entire 4. B. simplex
 - ff. Pinnae ovate, pinnatifid ... 3. B. boreale
 - dd. Sterile segment not so elongate, deltoid to triangular-lanceolate.
 - g. Sterile blade \pm deltoid..... 6. B. lanceolatum
 - gg. Sterile blade \pm triangular, about twice as long as broad 5. B. matricariifolium

1. B. multifidum (Gmelin) Rupr. var. multifidum -- Sterile segment 1 dm wide or less \pm bipinnatifid, broadly deltoid, inserted near the base of the stipe. Last year's blade often overwintering, the plant thus appearing bifoliate. Sporesis in late summer. Sandy sterile prairies. -- Mack, (L)-NF, NS-BC, US, Eur -- Var. intermedium (D.C. Eaton) Farw. (B. silaifolium Presl; B. ternatum Sw. var. intermedium D.C. Eaton) -- Larger and coarser. Blade up to 2.5 dm wide and \pm tripinnatifid. -- (Aka), L-NF, NS, (NB)-Q-BC, US.

2. B. Lunaria (L.) Sw. -- Moonwort (Herbe à la lune) -- The lanceolate limb simply pinnate, the pinnae broadly flabelliform. Insertion near the middle of the stipe. Open to semi-open places on sandy soils or dry bogs. -- G, K-Aka, L-SPM, NS, Q-BC, US, (SA), Eur, (Oc).

More luxuriant specimens with slightly larger spores have been segregated variously as a form, variety or species (B. min-ganense Vict.). This uncommon extreme appears to be sporadic in its distribution and its taxonomic significance is not obvious. The last monographer of the group, Clausen 1938, reports it from all three of our provinces, but the Saskatchewan report actually originated from Boss Hill Creek in southwestern Manitoba.

3. B. boreale Middle var. obtusilobum (Rupr.) Brown -- Much like the preceding, the limb somewhat larger, the pinnae ovate and pinnatifid. Grassy mountain slopes, below or above treeline. Often looking like a very lush B. Lunaria. -- Y-Aka, swAlta-BC, (US).

The eurasian var. boreale (including var. crassinervium (Rupr.) Christ.) has the sterile limb shorter and less deeply cut, the pinnae more clearly obovate or even flabelliform.

4. B. simplex E. Hitch. var. simplex -- Smallest and least divided. Up to 12 cm high. Limb 1-2 cm long, simple or trilobed to trifoliate, petiolate, inserted near the base. Sterile, open places: North Battleford -- NF, NS, NB-O, S, BC, US, Eur -- Var. tenebrosus (A.A. Eaton) Clausen -- Limb more elongate and more divided into 3-7 obovate pinnae. Peduncle 1-3 cm long, inserted towards the middle. Often looking like an intermediate to B. Lunaria, but the pinnae not flabelliform. -- Aka, NB-O, S-Alta, US, Eur.

A Macoun collection from Silver City (MTMG; DAO, photo) was originally cited by Burgess 1887 under B. matricariifolium. It was later revised to B. simplex by G.E. Davenport and cited accordingly by Macoun 1890. Upon examination, this collection proved to be made of immature specimens of B. Lunaria. This was the basis for all subsequent reports of B. simplex and B. matricariifolium for Alberta, but our own reports are based on more recent collections from Rich Valley (ALTA; DAO, photo) for B. simplex var. tenebrosus and Wilderness Park (DAO) for B. matricariifolium. The var. tenebrosus collection is not very uniform.

5. B. matricariifolium Braun (var. hesperium (Maxon & Clausen) Boivin; B. ramosum AA.) -- Middling in size and form. Sterile segment inserted above the middle, generally short pedunculate, ± bipinnatifid and ± triangular (that is about twice as long as large), the ultimate segments commonly obovate. Moist prairies and shores. -- (NF)-SPM, NS-BC, US, Eur.

6. B. lanceolatum (Gmelin) Rupr. (var. angustisegmentum Pease & Moore) -- Much like the preceding, but the sterile segment larger, sessile and inserted near the base of the panicle. Limb deltoid (that is nearly as wide as long), its ultimate segments tending to lanceolate. Moist prairies. -- G, (Y-Aka), L-(NF)-SPM, NS-Q(O), swS-swAlta-BC, US, Eur.

Usually grows with B. matricariifolium and often giving the

impression (perhaps fully justified) of being only a later maturing growth phase of *B. matricariifolium*. There is 2-3 weeks difference in the sporesis time of the two entities.

7. *B. virginianum* (L.) Sw. (var. *europaeum* Ångström) -- Rattlesnake-Fern. -- Largest and most divided, 2-5 dm high, the stipe puberulent near the base. Sterile segment (1)-2-3-(4) dm wide, sessile or nearly so, inserted near the middle, tripinnatifid to quadripinnatifid. Rich woods. -- K-Mack, Aka, L-NF, MS-BC, US, (SA), Eur -- *F. anomalum* Cody -- Lower segment partly modified and bearing some sporangia along with the normal green tissue. McKague. -- Q-O, S.

Plants of more sunny places have a smaller, less divided and more leathery limb, along with slightly larger sporangia. These are often segregated as var. *europaeum*, undoubtedly a mere ecological form.

Order 6. FILICALES

Sporangia submicroscopic, generally stipitate and borne dorsally on normal or specialized fronds.

- a. Sporangia disposed in a continuous manner along the limbless divisions of the rachis, not aggregated into sori 6. *Osmundaceae* p. 21
- aa. Sporangia disposed in clusters termed sori.
 - b. Frond looking like a 4-leaved clover 11. *Marsileaceae* p. 31
 - bb. Frond looking more like a typical Fern.
 - c. Frond simple, pinnatifid..... 10. *Polypodiaceae* p. 30
 - cc. Frond compound, at least at base.
 - d. Sori marginal and protected by the more or less revolute margin; pinnulae most often discrete and petiolulate 7. *Pteridaceae* p. 22
 - dd. Sori more or less removed from the flat or revolute margin; limb never divided into entire, discrete and petiolulate leaflets.
 - e. Indusium lacking or attached by a point only 8. *Aspidiaceae* p. 24
 - ee. Indusium placed laterally and attached by its whole length.
 - f. Fronds evergreen, 1.5 dm long or less... 9. *Aspleniaceae* p. 30
 - ff. Fronds not evergreen, much larger 8. *Athyrium* p. 29

6. OSMUNDACEAE (FLOWERING FERN FAMILY)

Sporangia not aggregated in sori, but disposed continuously along some branches of the rachis.

1. OSMUNDA L.

FLOWERING FERN

The fertile pinnae devoid of leafy tissue.

1. O. Claytoniana L. var. Claytoniana -- Interrupted Fern -- A rather large frond, pinnate, the pinnae pinnatifid. Some fronds are sterile, others are interrupted towards the middle by 2 to 4 pairs of fertile pinnae. Wet and marshy places. -- L-SPM, NS-seMan, US.

Younger fronds of var. Claytoniana exhibit a barely tinted pubescence, merely light brown, while the himalayan var. vestita (Wall.) Milde has russet pubescence.

7. PTERIDACEAE

(BRACKEN FAMILY)

The fertile fronds commonly made of distinct leaflets, more or less entire and petiolulate. Sori marginal, protected by the revolute margin of the limb, or by an indusium, or both. Indusium, if present, often more or less continuous along the margin.

- a. Leaflets strongly asymmetrical and bearing sori along one edge only 5. Adiantum
- aa. Bearing sori along both sides.
 - b. Frond 3-10 dm high 1. Pteridium
 - bb. Frond smaller, 2.5 dm high or less.
 - c. Stipe dark, brown to black.
 - d. Segments deeply dissected 2. Cheilanthes
 - dd. Segments entire 3. Pellaea
 - cc. Stipe pale, green to pale green ... 4. Cryptogramma

1. PTERIDIUM Gleditsch

BRACKEN

Scales lacking. Fronds all alike, with deeply divided segments and a continuous marginal sorus.

1. P. aquilinum (L.) Kuhn var. latiusculum (Desv.) Underw. (Pteris aquilina AA.) -- Bracken, Brake -- Large coarse fern with a more or less deltoid limb, not tufted, but with a deeply buried elongate rhizome. Limb tripinnatifid to tripinnate, glabrous or pubescent along the margin and the midnerve below. Light and sandy soils. -- NF-SPM, NS-(PEI-NB)-Q-(O)-sMan, swAlta, US, (CA, Eur) -- Var. champlainense Boivin (var. pubescens AA.) -- Similar but not deltoid and more pubescent. Limb rather ovate and puberulent over the whole of the under surface. -- Q-seMan, US -- Var. pubescens Underw. -- Larger and more pubescent. Frond commonly 1 mm high or more, its growth protracted, the growing tip remaining active a good part of the summer. Limb ovate, pubescent on both surfaces more so below. Waterton. -- (Aka), swAlta-BC, US, (CA).

Our varieties belong to the largely boreal ssp. aquilinum in which the ultimate segments are not wing-decurrent on the lower side or are equally wing-decurrent on both sides. In the mainly austral ssp. caudatum (L.) Bonaparte, the ultimate segments are decurrent on the lower side only, or at least more strongly so on the lower than on the upper side.

2. CHEILANTHES Swartz

LIP-FERN

Margins revolute mostly towards the tips of the lobes of pinnules. Fronds not dimorphous.

1. C. Feei Moore -- A small tufted fern, extremely pubescent. Stipe woolly, brown. Limb \pm tripinnate, gray-tomentose above, densely woolly below. Limestone cliffs: Rockies. -- swAlta-BC, US.

3. PELLAEA Link

CLIFF-BRAKE

Stipe dark colored. Fronds slightly dimorphic, the fertile ones with the margin of the limb continuously revolute all around the pinnule.

1. P. glabella Mett. var. simplex Butters (P. atropurpurea (L.) Link var. simplex (Butters) Morton; P. Suksdorfiana Butters) -- Rock-Brake -- Stipe brownish, black and shiny. Limb pinnately divided into discrete, petiolulate, entire leaflets. Rhizome and base of stipe densely scaly. Scales made of linear cells, these 10-15 times as long as wide. Cracks of calcareous rocks. -- swAlta-BC, (WUS) -- Var. nana (Rich) Cody (P. glabella Mett. var. occidentalis (E. Nelson) Butters) -- Usually smaller but the main characters detectable only with a strong hand-lens or binocular with power about X20: scales with cells oblong-lanceolate and only 3-5 times as long as wide. Lower pinnae often trilobed or trifoliate. -- swMack, Man-Alta, US.

Reports of P. atropurpurea from northern Saskatchewan are based on specimens (BM, CAN, DAF) which appear to be quite typical of var. nana as to pubescence of stipe and rachis, size and division of the frond, shape of cells of scales, etc.

4. CRYPTOGRAMMA Br.

ROCK-BRAKE

Stipe pale. Fronds strongly dimorphous, the fertile ones similar to Pellaea minus the dark stipe and rachis.

a. Fronds tufted and coriaceous 1. C. crispa
aa. Fronds spaced along the rhizome and very thin. 2. C. Stelleri

1. C. crispa (L.) Br. var. acrostichoides (Br.) C.B. Clarke -- Mountain-Parsley, Parsley-Fern -- Densely tufted and green, the fertile fronds twice larger and divided into entire, linear, petiolulate leaflets. Limb thickish, that of the fertile fronds strongly revolute. Crevices of dry precambrian and other acidic rocks. -- Mack-Aka, (L, Q)-O-BC, US, (Eur).

The eurasian var. crispa has thinner fronds in a lighter green and the basal scales are mostly of a uniform brown colour; the latter are mostly with a paler central zone in our american variety. Reports of this species for Baffin Island are rated as improbable; those for Labrador and Quebec have yet to be verified or confirmed.

2. C. Stelleri (S.G. Gmelin) Prantl -- Similar but not tufted, the fronds arising singly from an elongate rhizome. Limb

of the sterile frond very filmy. Shaded limestone cliffs. -- Y-Aka, (L)-NF, NS, NB-O, swAlta-BC, US, Eur.

The Porter Lake, Sask., reports are not substantiated by any specimen that we know of in Saskatchewan herbaria or elsewhere.

5. *ADIANTUM* L.

No indusium, but the edge of the leaflets is folded over in a very good imitation of an indusium, the sorus borne under the folded over portion. Revolute margin discontinuous, cut up into 3-6 segments per leaflet.

1. *A. pedatum* L. var. *aleuticum* Rupr. -- The frond cut in a most unusual manner. Petiole and rachises jet-black and shiny. Petiole bifurcate at summit; each primary branch is recurved and bears, on one side, 3-6 secondary branches, each of which is pinately divided into numerous, petiolulate, asymmetrical leaflets. Damp woods and rocky subalpine slopes, rare. -- Aka, NF, Q, swAlta-BC, US, (Eur).

In the typical eastern phase the limb is spread out horizontally. In our variety the frond is somewhat reduced and its primary segments are divergent to nearly erect. This distinction cannot always be applied satisfactorily and at times appears to be merely ecological.

8. ASPIDIACEAE (SHIELD-FERN FAMILY)

Family rather polymorphic, of miscellaneous Fern types. Sori commonly round or roundish. Indusia absent or more often present; if present, nearly always attached by a single point. *Athyrium* is an atypical genus with the sori elongate and the indusia attached lengthwise.

- a. Fronds strongly dimorphous, the fertile ones with the limb reduced to a mere envelope for the sori 1. *Onoclea*
- aa. Fronds all alike or near similar with a normal limb well developed.
 - b. Not tufted, but the rhizome long stoloniferous, sori mostly devoid of indusia.
 - c. Lowest pinnae with a well developed petiole.
 - d. Indusium absent; limb essentially bipinnate 5. *Carpogymnia*
 - dd. Indusia present; limb tripinnate to quadripinnatifid 7. *Cystopteris*
 - cc. All pinnae sessile or practically .. so 6. *Thelypteris*
 - bb. Tufted.
 - e. Sori without indusia 8. *Athyrium*
 - ee. Indusia present.
 - f. Sori elongate; indusia attached lengthwise 8. *Athyrium*

ff. Sori roundish; indusia attached by a point.

g. Indusium placed under the sorus.. 2. Woodsia

gg. Indusium covering the sorus.

h. Indusium hoodlike and attached laterally 7. Cystopteris

hh. Indusium flattish and attached in the center of the sorus.

i. Indusium peltate 3. Polystichum

ii. Indusium reniform-cordate, attached at the sinus 4. Dryopteris

1. ONOCLEA L.

Fronds strongly dimorphic, the fertile one much contracted, much less divided, strongly enveloping the sori, and brownish or blackish rather than green.

a. Frond oblanceolate1. O. Struthiopteris

aa. Deltoid and smaller2. O. sensibilis

1. O. Struthiopteris (L.) Hoffm. var. pensylvanica (W.) Boivin (Matteuccia Struthiopteris (L.) Tod. var. pensylvanica (W.) Morton; Pteretis nodulosa (Mx.) Nieuwl.) -- Fiddle-Heads-- Our largest fern, commonly 1 m or more high. Frond pinnate, the pinnae pinnatifid. The fertile frond dark, much simpler and only half as long. Damp woods. -- Mack, Aka, (NF), NS-BC, US.

Scales from the base of the stipe are uniformly brown in our variety, but show a blackish-brown central band in the typical eurasian phase.

Often placed in a segregate genus justified primarily by the simple type of nervation of this first species as contrasted with the anastomosed nerves of the next. As shown by Boivin 1961, the type of nervation is merely a reflection of the degree of expansion of the ultimate segments.

2. O. sensibilis L. -- Limb rather triangular and nearly simple, pinnate at base, pinnatifid above, the segments not cut but merely undulate at margin. Wet and marshy places, often on shores. -- L-SPM, NS-seMan, US, Eur.

2. WOODSIA Br.

Indusium neither covering nor protecting the sorus, but reduced to few laciniae more or less hidden under the sorus or seemingly mixed with the sporangia.

a. Stipe articulate, with a well defined abscission point.

b. Frond glabrous.

c. Stipe chaffy 2. W. alpina

cc. Not chaffy above the articulation ... 3. W. glabella

bb. Frond densely chaffy and pubescent below. 1. W. ilvensis

aa. Stipe not articulate, the old fronds breaking off rather irregularly 4. W. oregana

1. W. ilvensis Br. -- Our chaffiest and most pubescent species. All parts of the frond abundantly covered with chaff and long hairs, especially so on the under surface of the limb. Hairs and chaff at first white, soon becoming rusty and quite conspicuous. Stipes articulate and breaking off in age at the articulation point, leaving behind a tuft of stubs of nearly equal length. Very common on dry non calcareous cliffs. -- G-Aka, L-NF, NS, NB-BC, US, Eur.

2. W. alpina (Bolton) S.F. Gray -- Similar to the following, the stipe darker, bright brown, and chaffy below the limb. Pinnae slightly larger and slightly more divided. Shaded cliffs: Lake Todd. -- (G)-F-(K-Mack)-Y-Aka, (L)-NF, NS, (NB)-Q-Man, (BC, US), Eur.

3. W. glabella Br. -- Limb narrow and up to 2 dm long, being composed of numerous small deltoid pinnae that are nearly all of the same size. Limb glabrous and not chaffy. Stipe pale green, glabrous, not chaffy except below the articulation. Shaded, moist, calcareous or dolomitic cliffs. -- G-Aka, L-NF, NS, NB-BC, US, Eur.

4. W. oregana D.C. Eaton var. oregana -- Fronds 1-2 cm long, densely tufted. Stipes not articulate, the old ones breaking off rather irregularly, leaving behind a cluster of very uneven stubs, some of them often half as long as the remaining fronds. Limb lanceolate, pinnate and neither pubescent nor glandular, nor chaffy. Or sometimes the stipe and the limb slightly glandular, especially towards the insertion point of the pinnae. All sorts of rocky cliffs. -- Q-O, nws-BC, US -- F. Cathcartiana (Rob.) Boivin -- Neither pubescent nor chaffy, but abundantly and finely glandular throughout: Boisé Coteau. -- Q-O, swS, BC, US -- Var. Lyalli (Hooker) Boivin (W. scopulina D.C. Eaton) -- Not chaffy, but abundantly pubescent and glandular throughout. -- Y-(Aka), Q-O, nws-swAlta, gBC, US -- Var. squamosa Boivin -- Stipe chaffy and also lightly pubescent and glandular. Limb usually neither pubescent nor glandular, but sparsely chaffy, especially dorsally. Amisk Lake. -- wO, ecS, US.

3. POLYSTICHUM Roth

Evergreen fronds with round and peltate indusia.

1. P. Lonchitis (L.) Roth -- Horehound, Holly-Fern (Tripe de roche) -- Frond pinnate, narrowly oblanceolate. Pinnae lanceolate, serrate, with a single lobe near the base on the distal side. Shaded mountain cliffs and rocky slopes. -- G, (Y)-Aka, (L)-NF, NS, (NB)-Q-O, swAlta-BC, US, Eur.

4. DRYOPTERIS Ad.

SHIELD FERN

Indusium reniform and attached from the bottom of the sinus.

a. Fronds marcescent, 3 dm long or less 4. D. fragrans
WOODSIA

aa. Fronds longer.

b. Limb bipinnate 1. D. austriaca
bb. The limb less divided, pinnate or bipinnatifid to bipinnatifid.

c. Fronds dimorphous, pinnae up to 6 cm long 3. D. cristata

cc. Fronds all alike, larger, the main pinnae much longer 2. D. Filix-Mas

1. D. austriaca (Jacq.) Woyнар (var. dilatata (Hoffm.) Schinz & Thell., var. spinulosa (Müller) Fiori; D. dilatata (Hoffm.) Gray; D. spinulosa (Müller) Watt, var. americana (Fischer) Fern.; Aspidium spinulosum (Muller) Sw., var. dilatatum (Hoffm.) Link, var. intermedium (Muhl.) D.C. Eaton) -- Wood-Fern, Florist's Fern -- A large common wood fern with very much dissected fronds, used by florists as background foliage for bouquets. Up to 1 m high, the limb bipinnate and the pinnulae pinnatifid to pinnatifid. Fronds not dimorphous, but overwintering under the snow. Showy in moist woods. - G, K-(Mack-Y)-Aka, L-MF-(SPM), NS-BC, US, Eur, (Afr).

Usually divided in a series of segregates variously treated as varieties or species. We derive no intellectual satisfaction from their recognition, there is too much arbitrariness in the identification of many specimens and the various phenotypes appear to be more or less sporadic in their occurrence, with most names used having european type localities.

2. D. Filix-Mas (L.) Schott -- Very scaly throughout and the scales mostly filiform, often present even in the sinuses of the marginal teeth. Similar to the following, but not dimorphous and larger; the main pinnae 7-15 cm long. Frond 4-10 dm long, the limb 12-30 cm wide and usually oblanceolate. Mid summer. Wet woods and cliffs near lakes and rivers: Waterton. — G, MF, NS, Q-O, Alta-BC, US, Eur.

3. D. cristata (L.) Gray var. cristata (Aspidium cristatum (L.) Sw.) -- Fronds slightly dimorphous, the fertile ones slightly longer and narrower with the pinnae broader and ascending. Frond 5-6 dm high, the limb oblong-lanceolate to ovate-lanceolate. Indusia rather small, not fully covering the mature sori. Wet or boggy woods. -- MF-(SPM), NS-BC, US, Eur.

Grades eastward into a var. Clintoniana (D.C. Eaton) Und., with somewhat larger and non dimorphic fronds.

4. D. fragrans (L.) Schott (var. remotiuscula Kom.; Aspidium fragrans (L.) Sw.) -- A conspicuous cliff species with a tuft of green fronds arising from a much larger tuft of pendant old dead darkened fronds. Limb discolor, dark green above, bluish to rusty below. Indusia largest, persistent and imbricated, covering the lower face of the limb almost entirely. Dry rocky and steep habitats. -- G-Aka, L-MF, NS, NB-BC, US, Eur.

Larger plants from more southern and usually shaded cliffs are frequently distinguished as var. remotiuscula; probably little more than an ecological form.

5. CARPOGYMNIA Løve & Løve

Not tufted. Limb more or less ternately divided. Indusium absent.

1. C. Dryopteris (L.) Løve & Løve, var. Dryopteris (Dryopteris disjuncta AA.; Gymnocarpium Dryopteris (L.) Newm.; Phegopteris Dryopteris (L.) Fée) -- Oak-Fern -- A delicate, much divided, deltoid frond occurring scattered on the forest floor. Forms large colonies. Stipe black below. Limb 0.5-2.0 dm large, bipinnate and often somewhat ternately disposed in three planes. Rachis and limb glabrous or nearly so. Largest pinnulae pinnatipartite. Rich forests, especially coniferous ones. -- G, K-Aka, L-NF, NS-BC, US, Eur -- Var. disjuncta (Led.) Boivin -- Frond larger, 2-3 dm wide. Largest pinnulae pinnatisect at the base. Waterton. -- Alta-BC, nwUS -- Var. pumila (DC.) Boivin (G. Robertianum Hoffm.; Dryopteris Robertiana (Hoffm.) Christensen; Phegopteris Robertiana Hoffm.) A. Br.) -- Abundantly and finely glandular, especially along the rachis. Limb 2.5 dm wide or less, often less clearly ternate, often more triangular than deltoid. Sheltered calcareous rocks. -- Mack-Aka, NF, NB-BC, US, Eur.

Var. disjuncta (Led.) stat. n., Polypodium Dryopteris L. var. disjunctum Led., Fl. Ross. 4: 509. 1853.

Var. pumila (DC.) stat. n., Polypodium Dryopteris L. var. pumilum DC., Fl. Fr., ed. 3, 2: 565. 1815. This is a weak variety or possibly only an ecological form of shaded calcareous cliffs; intermediate specimens have been variously treated now as a form, now as interspecific hybrids.

6. THELYPTERIS Schmidel

Technically much like Carpogymnia long stoloniferous and not tufted. Indusia absent or present. Limb pilose along the nerves, often ciliate.

- a. Limb pinnate, lanceolate 1. T. palustris
aa. Limb broadly triangular, nearly simple.... 2. T. Phegopteris

1. T. palustris Schott var. pubescens (Lawson) Fern. (Aspidium Thelypteris AA.; Dryopteris Thelypteris (L.) Gray var. pubescens (Lawson) Nakai) -- Marsh-Fern -- Slightly dimorphous, the fertile fronds appearing more open because of the revolute margin of the limb. Limb lanceolate, pinnate, the pinnae pinnatifid, more or less pilose, especially along the main nerves. Indusia present. Marshes. -- (NF)-SPM, NS-O(Man, US).

2. T. Phegopteris (L.) Slosson (Dryopteris Phegopteris (L.) Christensen; Phegopteris polypodioides Fée) -- Beech-Fern. -- Limb broadly triangular and nearly simple. At least the lower two segments discontinuous from the rest, thus the limb is pinnate at base, pinnatipartite above. Ciliate and pilose along the nerves. No indusium. Wet woods. Unaccountably rare: lake Todd, lake Axis and Assineau. -- G, Y-Aka, L-SPM, NS-BC, US, Eur.

With only one known collection per province, we admit to being puzzled by this high degree of sporadism.

7. CYSTOPTERIS Bernh.,

FERN-BLADDER

Indusium hood-shaped, attached laterally and enveloping the sorus from the side. The indusium is early deciduous and this genus is thus not always easy to recognize.

- a. Limb \pm lanceolate, longer than its stipe..... 1. C. fragilis
 aa. Limb \pm deltoid, much shorter than its stipe... 2. C. montana

1. C. fragilis (L.) Bernh. var. fragilis (Filix fragilis (L.) Gilib.) -- Our only common and widely distributed species in the prairie regions. Easily and often confused with other species. Highly variable and not readily defined. Limb thin and wilting rapidly, much dissected, glabrous. Fronds up to 4 dm long, but variable in size and many sizes often present in the same tuft. Limb pinnate, the pinnae pinnatifid, the secondary segments \pm pinnatifid and serrate. Wooded slopes. -- G-Aka, L-NF, NS, NB-BC, US, CA, Eur, (Afr). -- Var. Huteri (Hausman) Luerksen -- Frond and rachis finely glandular. Rockies. -- (swAlta).

Typically, the spores are covered by spinules readily distinguished with a good microscope. A sporadic form in which the spores are merely rugose has been distinguished as a species, but the rank of form would seem to be more realistic: f. Dickena (Sim) stat. n., C. Dickeana Sim, Gard. Journ. 308. 1848.

2. C. montana (Lam.) Bernh. -- Rather similar to Carpogymnia Dryopteris, but each nerve ending above into an elongate, white fovea. And more dissected, tripinnate, the ultimate segments coarsely lobed to pinnatifid. Slightly scaly-pubescent along the rachises. Damp calcareous habitats. -- G, Mack-Aka, L-NF, Q-O, Alta-BC, US, Eur.

Cystopteris bulbifera (L.) Bernh. has often been reported for south-eastern Manitoba, yet we have found no corresponding specimen in CAN, HUH, MTMG, etc. The only possible justification for its occurrence in our area might be a collection by M.W. Hutchinson without locality but bearing the note "Eastern Manitoba, 1944" (MPM; DAO, photo). This generalized distribution is likely to be a verbatim repeat of the entry for the species in the list of Lowe 1943, rather than a place of collection. And the specimen itself is presumably of unknown origin.

8. ATHYRIUM Roth

Sori obviously elongate. Indusia present, elongate, attached laterally and by their whole length. An atypical genus with mostly the technical characters of the Aspleniaceae. One atypical species lacks indusia.

- a. Sori and indusia elongate or recurved ... 1. A. Filix-femina
 aa. Sori orbicular, indusia lacking 2. A. distentifolium

1. A. Filix-femina (L.) Roth var. Filix-femina (var. Mitchauxii (Sprengel) Farw.; Asplenium Filix-femina (L.) Bernh.) -- Lady-Fern (Fougère femelle) -- A rather large and much dissected

fern, quite similar to Dryopteris austriaca and readily confused with it when sterile. But the sori about twice as long as broad and the indusia lanceolate. Ultimate nerves not reaching the tip, but usually ending slightly to the side of it (excurrent into spinulose tips in Dryopteris austriaca). Limb bipinnate, the pinnulae deeply lobed. Wet woods. -- G, L-NF-(SPM), NS-Man, US, Eur -- Var sitchense Rupr. (var. cyclosorum (Rupr.) T. Moore) -- Mostly larger, usually 7-15 dm high. Indusia rather short, mostly suborbicular, or deltoid or reniform. -- Mack-Aka, wAlta-BC, (wUS).

The segregation of our plants as an american variety or species is not tenable on a morphological basis. And var. sitchense itself is a rather weak variety.

2. A. distentifolium Tausch var. americanum (Butters) Boivin (A. alpestre (Hoppe) Rylands var. americanum Butters) -- Bipinnate to tripinnatifid frond with small, round, naked sori. Frond 3-6 dm high, ± oblanceolate. Pinnulae lanceolate, 1-2 cm long. Usually one of the marginal lobes is strongly recurved and partly covers the adjacent sorus. Wet cliffs and talus slopes at or below timberline: Waterton. -- (G, Aka, L)-NF, seQ, Alta-BC, wUS.

Var. americanum is based on a series of tendencies and not on a simple morphological discontinuity; its frond is usually narrower, the pinnulae often more remote and the smaller sori usually show no trace of indusia.

9. ASPLENIACEAE (SPLEENWORT FAMILY)

Sori elongate. Indusia similarly elongate and attached laterally by their whole length.

1. ASPLENIUM L. SPLEENWORT

Evergreen ferns, the limb quite dissected.

1. A. viride Hudson -- Small delicate fern, the fronds about 1 dm long, the limb linear, pinnate, the numerous small pinnae subopposite.

Stipe blackish below, with a few hair-like scales. Quite similar to Woodsia glabella, but the latter has the stipe pale green, articulate and coarsely scaly. Limestone cliffs. -- (G), swMack-(Y)-Aka, NS,NB-O, swAlta-BC, (US), Eur.

10. POLYPODIACEAE (POLYPODY FAMILY)

Frond simple, the sori dorsal, rounded and without indusium.

POLYPODIUM L.

Rhizome elongate, the fronds not tufted, coriaceous.

1. P. vulgare L. var. virgianum (L.) Eaton -- Polypody (Tripe de roche) -- Frond simple but pinnatifid; lobes linear to oblong-lanceolate, not narrowed at base, finely serrate, obtuse or acute at tip. Sori rather coarse, in two parallel rows on the back of each lobe. Abrupt places, mostly acid and rocky,

sometimes forming a dense carpet over rocky outcrops. Precambrian regions. -- sMack-Aka, NF-SPM, NS-eBC, US. -- Var. columbianum Gilbert -- Pinnae slightly narrowed near the base, oblong lanceolate to obovate, more or less rounded at tip. Waterton. -- Alta-sBC.

11. MARSILEACEAE

Fronds dimorphous, the sterile one digitately divided, the fertile one tightly enroled into a pea-sized structure called sporocarp.

1. MARSILEA L.

Sterile fronds divided into 4 terminal leaflets.

1. M. mucronata Braun (M. vestita AA.) -- Looking just about like a four-leaved Clover. Stems elongate, creeping, rooting in the mud, with tufts of rusty hairs at the nodes. Sterile fronds in small fascicles at each node. Stipes inserted directly at the node and bearing only one sporocarp each. Muddy shores and shallow waters. -- S-BC, US.

Sub-division 2. GYMNOPHYTINA

CONIFERS

Plants reproducing by seeds borne on the ventral face of open scales. A single class with us.

Class. 5. PINOPSIDA

Seeds two together on a scale. Scales disposed in cones. Resinous woody plants, mostly with persistent leaves. Only one order.

Order 7. CONIFERALES

- a. Leaves alternate or in fascicles.
 - b. Cone reduced to a single ovule; fruit a one-seeded berry12. Taxaceae p. 32
 - bb. Cone many-seeded and more or less woody13. Pinaceae p. 32
- aa. Leaves opposite or verticillate14. Cupressaceae p. 36

12. TAXACEAE

(YEW FAMILY)

Single genus

1. TAXUS L.

YEW

Much like a small Fir or Spruce in general appearance, but the cones reduced to two stamens or a single ovule. Fruit a fleshy one-seeded berry.

- a. Trailing shrub; needle with a straight tip...1. T. canadensis
- aa. Small tree; needle with tip bent backwards...2. T. brevifolia

1. T. canadensis Marsh. -- Ground-Spruce (Buis de sapin) -- Like a trailing Spruce on the forest floor. Central trunk lacking; branches trailing at base, ascending at tip. Needleless linear, 1-2 cm long, subpetiolate, more or less disposed in two ranks, flat, abruptly acuminate into a straight sharp tip. Berry red. Scattered in moist coniferous woods, rare: York Factory, Indian Bay. -- NF-(SPM), NS-Man, US.

The York Factory record (CAN; DAO, photo) is a long way from the rest of the range and has never been confirmed. It is now considered questionable as to location; its specific identification has been repeatedly confirmed.

2. T. brevifolia Nutt. -- A tree, erect and with a good central trunk. Otherwise quite similar to the preceding and not readily distinguished in the herbarium except that the tip of each needle is deflexed backwards at an angle of about 30 degrees. Scattered in moist coniferous woods: Waterton -- (Aka), Alta-BC, US.

13. PINACEAE

(PINE FAMILY)

Needles in fascicles or spirally arranged. Scales spirally arranged in the cone.

- a. Needleless deciduous, alternate on the leading shoots, in tufts of 10-20 on the short side-shoots 2. Larix

aa. Needles persistent.

b. Needles all in fascicles 1. Pinus

bb. Needles all alternate.

c. Needles obviously flattened

d. Needles sessile..... 5. Abiesdd. Needles neatly short-petioled... 4. Pseudotsugacc. Needles squarish 3. Picea

1. PINUS L.

PINE

Needles all in fascicles, tightly wrapped together at the base. Scales of the cone rather thick-woody.

a. Needles in 5's.

b. Needles very finely and remotely serru-

late 1. P. Strobus

bb. Needles entire.

c. Cone purple 3. P. albicauliscc. Cone green or almost entirely so ... 2. P. flexilis

aa. Needles in 2's.

d. Needles usually 10-15 cm long 4. P. resinosadd. Needles usually 3-5 cm 5. P. divaricata

1. P. strobus L. -- White Pine (Pin blanc) -- A very tall tree, usually overtopping the forest. Needles in 5's, minutely and remotely denticulate, straight and soft, commonly 5 cm long. Young twigs tomentose. Cones commonly 8-10 cm long. Seeds with a long wing. Scattered in the forest or in dense stands in the dryer sites, especially over nearly bare rock. Southeast. -- NF-(SPM), NS-seMan, US-- Var. monticola (Douglas) Nutt. (P. monticola Douglas) -- Barely distinct. Cones usually longer, at least 10 cm long. Young twigs often less densely pubescent. Rockies. -- Alta-BC, US.

In the field the Eastern and Western White Pine seem almost identical. In the herbarium they are indistinguishable in the absence of cones.

2. P. flexilis James -- Limber Pine -- Needles in 5's but entire, stiffer and falcate. A more middle size, tree with the young twigs becoming glabrous. Cones essentially green, at least 8 cm long. Seeds nearly wingless. Usually as scattered trees among taller species on dry rocky slopes. -- swAlta-BC, US.

3. P. albicaulis Eng. -- A small to depressed alpine or subalpine tree with a smooth bark much like that of Abies. Otherwise quite like P. flexilis. Cones purple and smaller, remaining closed. Open slopes and rocky ridges. Rockies.-- swAlta-BC, US.

4. P. resinosa Aiton -- Red Pine (Pin Rouge) -- Needles very long and in 2's, somewhat stiff, usually 10-15 cm long, usually forming big tufts at the end of branches. Bark breaching up in large brownish plates. Cones 4-6 cm long. Dry light soils. Southeast. -- NF, NS-seMan, US.

5. P. divaricata (Aiton) Dumont var. divaricata (P. Banksiana Lamb.) -- Jack Pine (Cyprès) -- Needles shortest, stiff,

in 2's, falcate, mostly 3-5 cm long. Cones persistent, about 4 cm long, ascending, incurved, not spiny. A very common conifer on well drained soils, especially on sand, often in pure formations. General north of the prairies. -- sMack, NS-Alta, US -- Var. latifolia (Eng.) Boivin (P. contorta Douglas var. latifolia Eng.; P. Murrayana AA.) -- Lodgepole Pine (Cyprès) -- Cones straight, more or less reflexed, each scale with a strong dorsal protuberance ending in a small pine. Western Alberta and Cypress Hills. -- Mack-Aka, S-BC, US-- X Var. Musci Boivin -- A polymorphic population intermediate between var. latifolia and the type, presumably of hybrid origin. Cones usually straight, variously divergent and more or less spiny. From lakes Primrose and Hasbala westward across central Alberta. -- Mack, S-Alta.

Pinus divaricata (Aiton) Dumont -- Validated by a reference to an earlier name validly published in the Hortus Kewensis. Antedates by one year P. Banksiana Lamb. in current use.

The report of Pinus ponderosa Douglas for Alberta is based in part on R.G.H. Cormack, Carbondale River, near Lynn Creek Cabin, about 10 miles from B.C. Border, rocky-sandy shore, July 22, 1955 (ALTA; DAO, photo). According to T.C. Brayshaw (verbatim) who visited the spot recently, the original cluster of saplings is now reduced to a single rapidly growing tree. This unique individual is some 40 miles from the nearest member of its species and its habitat is unusual to say the least. Local tradition has it that it was originally seeded in and there seems to be no reason to doubt that this is in no way a spontaneous occurrence. There is also at CAN a specimen labelled Dawson, Missouri River, Alta, June 30, 1881. But the Missouri River is now entirely on the U.S. side of the boundary.

2. LARIX Adanson

LARCH

Needles deciduous, pale green and turning yellow in the fall. Branches of two kinds, the leading ones with numerous alternate leaves, the lateral one stubby and ending in a tuft of leaves. Cones erect, persistent.

- a. Twigs tomentose, the tomentum persistent2. L. Lyallii
- aa. Twigs glabrous, or pubescent when young only.
 - b. Needles almost 1-2 cm long; scales glabrous 1. L. laricina
 - bb. Needles about 3 cm; scales puberulent dorsally 3. L. occidentalis

1. L. laricina (DuRoi) K. Koch -- Tamarack (Epinette rouge) -- A bog species with pale green and very sparse foliage. Twigs glabrous. Needles rounded above, keeled below. Cones 1.5 cm long or less, at first pink or purple, maturing pale green to straw-coloured. Bracts very short and hidden between the glabrous scales. Common in bogs. -- K-Aka, L-SPM, NS-BC, US.

2. L. Lyallii Parl. -- A small tree with densely tomentose branchlets, the tomentum persisting many years after the leaves have fallen off. Branchlets ± drooping. Leaves squarish, that

is keeled above and below, with all four faces deeply concave. Cones 3-5 cm long, the very long bracts protruding between the scales, their tips reflexed. High alpine and forming small bluffs above the general timberline. Rockies. -- Alta-BC, (US).

3. L. occidentalis Nutt. -- A very tall tree with brittle branchlets, at first puberulent, soon glabrous. Leaves about 3 cm long, convex above, keeled below. Cones of middle size. Bracts with long tips protruding between the scales, the latter densely puberulent dorsally. Low montane on wetter soils. Crow's Nest and Kananaskis. -- Alta-BC, US.

3. PICEA Link

SPRUCE

Trees with the cones pendent at maturity. Needles squarish, densely and spirally disposed on the branches. Leaves, when falling off, leaving behind strongly protuberent and decurrent stubs. Cones with small bracts hidden between the scales.

- a. Cones lanceolate, 3-6 cm long; twigs glabrous to puberulent 1. P. glauca
- aa. Cones ovoid, 1.5-2.5 cm long; twigs puberulent 2. P. mariana

1. P. glauca (Moench) Voss. var. glauca (P. canadensis Miller) -- White Spruce (Epinette blanche) -- Twigs glabrous. Needles squarish, sessile, 1.0-1.5 cm long. Cones annual, drooping, pale green. Scales broadly rounded and entire at tip. A straight and common timber species, prefers poor and somewhat acid soils. -- (K)-Mack-Aka, L-NF-(SPM), NS-BC, US -- Var. albertiana (S. Brown) Sarg. (var. Porsildii Raup) -- Variable and more or less intermediate between var. glauca and var. Engelmannii. Twigs glabrous to puberulent. Needles 1.0-2.0 cm long. Scales variable, often varying within the same cone, commonly rounded or obtuse and finely eroded at summit. Cypress Hills and western Alberta. -- (K)-Mack)-Y-(Aka), S-BC, (US) -- Var. Engelmannii (Parry) Boivin (P. Engelmannii Parry) -- Twigs puberulent. Needles mostly 1.5-2.0 cm long. Scales truncate to obtuse and erose at tip. A montane to subalpine type in western Alberta. -- Alta-BC, US.

Var. albertiana is somewhat variable and essentially intermediate to the other two varieties. Often it gives the impression of being a hybrid population, but it ranges much beyond the area of overlap of the other two phenotypes.

Older trees will on occasion retain a smooth bark covered with resin-filled blisters reminiscent of Abies. This variation is fairly frequent within the range of var. albertiana and it has been named var. Porsildii.

2. P. mariana (Miller) BSP. -- Black Spruce (Epinette noire) -- A smaller tree with smaller and purple persistent cones. Twigs glandular puberulent. Needles about 1 cm long. Cones commonly persisting through the second season. A common species of poorer and wetter soils, especially in bogs. General north of the prairies. -- (K)-Mack-Aka, L-NF-(SPM), NS-BC, US.

A report of Picea rubra Dietr. by Johnstone 1939 is based on a collection, J. Jeffrey, Oxford House, Sept. 19, 1850 (E; DAO, photo), now revised to P. mariana.

4. PSEUDOTSUGA Carr.

Cones pendant at the tip of the branchlets. Needles flat, short-petioled. Scales very long, very conspicuous, trifid at tip.

1. P. Menziesii (Mirbel) Franco -- (P. taxifolia (Poiret) Britton) -- B.C. Fir, Douglas Fir (Pin Douglas, Pin de la Colombie) -- A giant tree westward, but of more reasonable size with us. Needles with a short but well defined petiole. Bracts about twice as long as the scales. Local at low altitudes in the Rockies, mostly on rocky or gravelly ground. -- swAlta-BC-- F. Alexidis Boivin -- Low, depressed and straggling. Alpine habitats at high altitude in Waterton--swAlta.

Rocky Mountain specimens will often exhibit shorter cones and leaves and may be distinguished as var. glauca (Beissner) Franco. However the range of morphological overlap with the typical variety is too wide and the distinction is not a practical one, unless one is willing to use the place of collection as a primary character for the majority of the specimens.

5. ABIES Miller

FIR

Cones erect, the scales deciduous and leaving behind the persistent, stiffly erect axis. Needles flat and sessile; when falling off leaving behind a smooth, round and non-protuberating scar.

1. A. balsamea (L.) Miller var. balsamea -- Balsam, Balsam-Fir (Sapin) -- Bark smooth, with numerous blisters containing a clear resin called balsam. Leaves flat, those of the lower branches usually forming a two-ranked spray and with few, if any, short lines of glaucous stomata above. Main branches commonly in verticils of about 6. Cones purple violet, turning blackish. Fresh woods. --sK, L-NF, NS-seBC, US-- Var. fallax (Eng.) Boivin (A. lasiocarpa (Hooker) Endl.) -- Needles more glaucous, those of the lower part of the foliage with 6-12 glaucous lines of stomata, of which 4-8 lines will run most of the length of the needle. Western Alberta. -- (swMack)- sY-Aka, wAlta-BC, US.

14. CUPRESSACEAE

(CYPRESS FAMILY)

Evergreen trees, usually similar to the Pinaceae, but with the leaves and cone scales opposite or verticillate.

a. Trees; cone woody 1. Thuja
aa. Low shrubs; fruit a bluish berry 2. Juniperus

1. THUJA L.

ARBOR-VITAE

Cone with opposite woody scales. Trees with more or less flattened twigs of small, closely imbricated, adnate, scaly leaves.

- a. All shoots strongly flattened; dorsal and ventral leaves of the lateral shoots broadly obtuse at summit 1. T. occidentalis
- aa. Main leading shoots cylindrical; all leaves
* acute at summit 2. T. plicata

1. T. occidentalis L. -- Cedar (Cèdre) -- A small tree. Foliage compact, of strongly flattened sprays. Leaves opposite, in 4 ranks, those of the dorsal rank with a well defined gland, brown or clear green. Cone small, about 1 cm long, of a few opposite woody scales. Wet places and limestone outcrops. South-eastern Manitoba. -- NS-Man, US.

2. T. plicata D. Don -- Cedar (Cèdre) -- A giant tree westward, much smaller with us. Closely resembling the preceding but the leading terminal shoots not flattened; all leaves more or less acute and the glands indistinct, being of the same color as the rest of the leaf. Moist woods. Rare and local in the Rockies. -- seAka, Alta-BC, US.

2. JUNIPERUS L.

JUNIPER

Cone maturing into a bluish berry. Depressed or creeping shrubs with opposite or verticillate leaves.

- a. Leaves verticillate in 3's 1. J. communis
- aa. Leaves opposite.
 - b. Creeping shrub 2. J. horizontalis
 - bb. Small tree 3. J. scopulorum

1. J. communis L. var. depressa Pursh (var. saxatilis AA.; J. sibirica AA.) -- Ground Juniper (Genève, Buis) -- Needles verticillate in 3's. A low shrub, the branches decumbent, ascending at tip, forming round patches. Leaves 7-15 mm long, straight or incurved at base, strongly carinate, with a ventral glaucous band of stomata. Stomatal zone usually less than half as wide as the leaf. Leaf tips spinescent, with a mucro about 0.5 mm long. Local in sandy soil, dry woods or rocky slopes. -- K-Aka, L-NF-(SPM), NS-BC, US -- Var. saxatilis Pallas (var. montana Aiton) -- Branches more closely creeping. Needles smaller, 4-10 mm long, merely acute or short acuminate, the glaucous zone wider, usually at least half as wide as the leaf. Rocky places in alpine and subarctic habitats. -- G, K-Y-(Aka), L-NF-(SPM), NS-PEI, Q-nMan, swAlta-BC, US, Eur.

Some 8 or 10 collections from the upper Mackenzie basin were reported by Raup 1936 as var. montana. We have examined about half of these specimens and revised them all to var. depressa.

2. J. horizontalis Moench (Sabina horizontalis (Moench) Rydb.) -- Creeping Juniper (Savinier) -- A creeping shrub with small opposite leaves, usually forming a compact and elastic carpet. Green or glaucous. Leaves variable, 1-2-(6) mm long, closely imbricated, adnate to nearly free, more or less acute and ending in a slightly mucronulate tip. Eroded dunes and

hillsides, also on rocky exposures. -- K-Aka, (L)-NF-SPM, NS-BC, US.

2 X -- J. Fassetii Boivin (J. scopulorum Sarg. var. patens Fassett) -- Hybrid of J. horizontalis X scopulorum. Commonly 1 mm high, a diffusely branched shrub, sometimes partly decumbent. Leaves acute to mucronulate. Local in the Rockies. -- swAlta-BC, US.

3. J. scopulorum Sarg. -- A small tree, commonly 2-3 mm high, with a well defined central trunk. Otherwise barely distinguishable from J. horizontalis. Leaves acute at tip, rarely mucronulate. Hillsides, especially near watercourses. Rockies, rare. -- swAlta-BC, US.

Sub-division 3. ANGIOPHYTINA FLOWERING PLANTS

Plants with flowers. Ovules borne in closed chambers formed of carpels.

- a. Leaves with nervation commonly pinnate or reticulate. Flowers variable, commonly 5-merous, almost never 3-merous. Trees, shrubs or herbs, often with a taproot 6. Dicopsida
- aa. Leaves with parallel nerves. Flowers commonly trimerous, often much reduced. Herbs without a taproot 7. Monopsida part IV

Class 6. DICOPSIDA

DICOTS

Flowers commonly 5-merous, or 2-merous, or 4-merous, or the floral parts in variable number, sometimes much reduced in number, almost never 3-merous. Trees, shrubs or herbs, often with a taproot. Vascular tissues forming a cylinder around a central pith. Bark present, more or less developed.

- a. Stem woody, perennial, increasing in diameter through a cambium located between the wood and the bark 1. Lignidae
- aa. Stem herbaceous, annual, or perennial, the bark poorly developed 2. Herbidae part II

Sub-class 1. LIGNIDAE

WOODY DICOTS

Plants perennial, commonly woody, the bark usually well developed. Sometimes herbaceous.

The Lignidae also include a variety of herbaceous groups. These are not included in the key below, but will be found in the key to the Herbidae.

- a. Leaves and buds opposite or verticillate.
 - b. Leaves simple Group 1, p. 39
 - bb. Leaves compound Group 2, p. 41
- aa. Leaves and buds alternate, or sometimes alternate on the leading shoot, but fasciculate on the short shoots.
 - c. Leaves compound Group 3, p. 41
 - cc. Leaves simple
 - d. Climbing vines Group 4, p. 42
 - dd. Not climbing
 - e. Leaves entire Group 5, p. 42
 - ee. Leaves denticulate to more or less deeply lobed Group 6, p. 43

Group 1

Leaves opposite or verticillate, simple.

- a. Small and only semi-woody shrubs, 3 dm high or less Group 1-A
- aa. Taller and obviously woody.

SCAEVOLA GAUDICHAUDIANA & S. MOLLIS

Otto & Isa Degener
Mokuleia Beach, Oahu, Hawaii

The December 16, 1966 copy of "Evolution" reached the north shore of the Island of Oahu recently, and in it Dr. George W. Gillett (pp. 506-516) discusses in detail, and carefully illustrates, "Hybridization and its Taxonomic Implications in Scaevola Gaudichaudiana Complex of the Hawaiian Islands." As our own publications with this complex began in June 30, 1932 and were conducted apparently independently of Dr. Gillett's researches, we herewith review them to show our early findings.

The two species involved are S. gaudichaudiana Cham. and S. mollis Hook. & Arn. Of the former we (Flora Hawaiiensis, Fam. 340, Dec. 27, 1957.) recognize the species itself as occurring on Oahu; with forma kauaiensis Skottsb. as an endemic to the Island of Kauai; with forma leucocarpa Skottsb. as an endemic to Oahu "and occasionally intergrading with" the black-fruited species itself; and with variety stenolithos Skottsb. endemic to the Waianae Range of Oahu. The Molokai and Lanai plants, following the monographer Skottsberg (Bishop Mus. Bull. 43: 17-23, 1927.), we recognize as S. chamissoniana Gaud., sensu stricto and two varieties. As these hardly belong to our complex, we omit them here.

Regarding S. mollis, Degener & Greenwell (Fl. Haw., Nov. 1, 1947.) recognized S. mollis s.s. as occurring only on the Koolau Range of Oahu; while the variety albiflora Deg. & Greenwell is limited to the Waianae Range of the same island. Forma triloba St. John is an aberrant form known from a single plant discovered in 1939 in the Koolau Range and never observed again.

Scaevola kahanae Degener (ibid. June 14, 1933.) grew along the Kahana Ditch Trail, Koolau Range, Oahu. Though the author of this binomial at the time wrote that "it probably shows certain hybrid relationships to S. Gaudichaudiana, and S. mollis Hook. & Arn.," we are now convinced it is merely a hybrid exhibiting chiefly S. gaudichaudiana features. We join with Gillett (p. 515) that this is an example of contributing a "plethora of names" to our flora and that the specimens should have been designated simply as "S. gaudichaudiana X S. mollis."

As the Flora Hawaiiensis, Books 1 - 7, is being privately printed in a limited edition of 3,000 or less copies and is evidently not known to many writers and readers, we herewith copy pertinent statements regarding the "complex" printed Dec. 27, 1957. These verify, in many instances, Dr. Gillett's findings of about a decade later. Regarding S. gaudichaudiana s. s., we read:

"An ubiquitous, aggressive plant throughout the Koolau Range of Oahu, growing in open forests and glades above about 700 feet elevation with the far less common S. mollis Hook. & Arn. These two species repeatedly hybridize, some of the resulting crosses tending to maintain their characteristics for several generations. Others seem to split up into a diversity of shapes, or cross back into S. gaudichaudiana or S. mollis. The resulting swarm of hybrids has caused considerable nomenclatural confusion. For example, S. procera Hillebr., is listed as occurring in Oahu in error by Skottsberg (Bull. B. P. Bishop Mus. 43: 33. 1927.), he basing his findings upon Forbes No. 2215.0., 'Oahu, Wahiawa, head gate trail,' 1915. This plant, as well as Forbes Nos. 2211.0 and 2213.0, from the same region; and Hosaka No. 958 from Kipapa Gulch, 1933, likewise identified by Skottsberg as S. procera, are all hybrids in which S. mollis characters prevail except for a slightly longer inflorescence and less tomentum. S. procera, hence, is unknown from Oahu. S. cerasifolia f. tomentosa Skotts. (Acta Hort. Gothoburg. 15: 501. 1944.), hardly worthy a name, is merely another hybrid, this time showing still closer affinity with S. mollis. S. cerasifolia Skotts. (Bull. B. P. Bishop Mus. 43: 36. 1927.), typified by a plant from Pauoa Flats and said to be found also on Konahuanui and Punaluu, on the other hand, are hybrids showing close affinity with S. gaudichaudiana. S. kahanae Degener (Fl. Haw. 6/14/33), almost synonymous with Skottsberg's S. cerasifolia and therefore hardly worth naming, is perhaps still closer; while Rock & Shaw, without number, collected on Konahuanui in Sept. 1912, scarcely differs from true S. gaudichaudiana except for purple flowers. S. gaudichaudiana s.s., also occurs in the Waianae Range with the var. stenolithos Skotts., mentioned below:"

Regarding S. gaudichaudiana var. stenolithos we wrote Dec. 27, 1957: "Known only from the Waianae Range of Oahu; plants labeled as this variety but coming from other islands, such as West Maui, we find are misidentified. This variety or possibly the species itself apparently hybridizes with S. mollis var. albiflora of the same mountain range to produce plants like Wilbur 597 (in error labeled as the Kauai or Molokai S. procera var. pseudomollis Skotts., in the Bishop Museum by an unknown hand), "Waianae Range. Slope leading down into South Palawai Gulch. More or less N. side. 3 m. shrub. Flowers white, c. 2700 ft. 27, March 1948." The Wilbur specimen is mainly S. gaudichaudiana var. stenolithos with some influx of S. mollis var. albiflora; thus the slightly larger leaves are coarsely glabrate especially beneath, the twigs are pubescent, and the flower buds and leaf buds are pubescent as in S. mollis var. albiflora. The inflorescence is not constricted as in the latter variety, nor longer than the leaves as in S. gaudichaudiana var. stenolithos. It is about two-thirds the length of the

leaves. The corolla tube is hairy, almost as much so as Webster 1450, evidently collected with Wilbur and perhaps coming from the very same shrub."

It is a pity Dr. Gillett failed to note our work on the Scaevola gaudichaudiana complex - among the twenty-six papers cited in his literature ours are eloquently omitted. Had he done so he would have saved time and funds. That his study independently came to essentially the same conclusion as published in the Flora Hawaiensis decades before is no surprise.

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ADDENDA ON PENSTEMON

Ralph W. Bennett

In two recent issues of *Phytologia*, varieties of *Penstemon hirsutus* Willd. were published without citation of herbarium material. To complete the descriptions, the following information should be added:

P. hirsutus Willd. var. *pygmaeus* R. W. Bennett,
Phytologia 9: 58. 1963.
TYPE COLLECTION: R. W. Bennett s.n. (holotype US 2503557), cultivated in Arlington, Virginia, May, 1966.

P. hirsutus Willd. var. *minimus* R. W. Bennett,
Phytologia 12: 477. 1966.
TYPE COLLECTION: R. W. Bennett s.n. (holotype US 2503556), cultivated in Arlington, Virginia, May, 1967.

NOTES ON BROMELIACEAE, XXVI

Lyman B. Smith

ABROMEITIELLA

Unlike Mez (Pflanzenreich IV. 32: 278. 1935) and Castellanos (Gen. & Spec. Pl. Argent. 3: 186. 1945), I am unable to distinguish more than two species of Abromeitiella. Mez's distinction of a small number of leaf-spines for A. chlorantha collapses on examination of luxuriant live material like that of Marnier-Lapostolle, that shows great variation of leaf-spines on a single plant. Castellanos' detailed flower measurements for A. pulvinata do not hold either. For the present there seem to be two species distinguishable on leaves and possibly on sepals as follows, but that is not saying that further collections may not show this to be a monotypic genus with several varieties:

1. Leaves not over 22 mm long; sepals not over 13 mm long.
Southern Bolivia, northwestern Argentina....1. A. brevifolia
1. Leaves 50-150 mm long; sepals 16 mm long. Northwestern Argentina.....2. A. lorentziana

1. A. BREVIFOLIA (Griseb.) Castellanos, Anal. Mus. Nac. Hist. Buenos Aires 36: 371, pl. 2, 3, 6. 1931. Navia brevifolia Griseb. Symb. Argent. in Goett. Abh. 34: 332. 1870. Type: Lorentz & Hieronymus 47. Dyckia grisebachii Baker, Hanb. Bromel. 190. 1889. Non Dyckia brevifolia Baker 1871. Tillandsia chlorantha Spegazzini, Com. Mus. Nac. Buenos Aires 1: 87. 1899. Type: Spegazzini s. n. Pitcairnia brevifolia (Griseb.) Fries, Nov. Act. Reg. Soc. Sci. Upsal. IV. 1, pt. 1: 73. 1905. Lindmania brevifolia (Griseb.) Hauman, Anal. Mus. Nac. Buenos Aires 29: 413, pl. 2, 1. 1917. L. chlorantha (Spegazzini) Hauman, op. c. 415. Pitcairnia chlorantha (Spegazzini) Castellanos, Com. Mus. Nac. Buenos Aires 2: 149. 1925. Abromeitiella pulvinata Mez in Mez. Bot. Archiv. 19: 460, fig. 1-27. Type: Fiebrig in hort. Berlin. Mesiothamnus brevifolius (Griseb.) Harms, Notisblatt 16: 376. 1893. Abromeitiella chlorantha (Spegazzini) Mez, Pflanzenreich IV. 32: 278. 1935. Pl. I, fig. 1: Leaf x 1.

2. A. LORENTZIANA (Mez) Castellanos, Lilloa 10: 450. 1944. Pitcairnia lorentziana Mez in DC. Mon. Phan. 2: 371. 1892. Type: Lorentz s. n. Hepetis lorentziana (Mez) Mez in op. c. 374. Abromeitiella abstrusa Castellanos, Anal. Mus. Nac. Hist. Nat. Buenos Aires 36: 379, pl. 1, 5. 1931. Type: Castellanos 29/60. Pl. I, fig. 2: Leaf x 1.

AECHMEA

AECHMEA MARLAE-REGINAE H. Wendl. Hamb. Gartenseit. 12: 38. 1861 (staminate); Baker, Bot. Mag. 105: pl. 6441. 1879 (staminate); Möbius, Gartenflora 49: 337, pl. 1477. 1900 (pistillate). Ae.

lalindei Linden & Rodigas ex Rodigas, Ill. Hort. 30: 45, pl. 481. 1883 (pistillate); Mez, Pflanzenreich IV. 32: 156. 1934; L. B. Smith, N. Am. Fl. 19: 206. 1938. Ae. gigas E. Morr. ex C. H. Wright, Bot. Mag. 132: pl. 8107. 1906 (pistillate).

Belatedly I make the synonymy indicated by the fact that Aechmea mariae-reginae is dioecious as noted by C. H. Lankester (Bromel. Soc. Bull. 4: 29. 1954) so that the two sexes are easily mistaken for different species. The pistillate flower contains stamens but evidently they are not functional.

ANANAS

ANANAS LUCIDUS Mill. Gard. Dict. ed. 8. no. 4. 1768. Type: Dillenius, Hort. Elth. Ananas non aculeatus Pitta dictus Plum. Spec. (Cat. Pl. Amer.) 20. 1703. A. lucide virens, folio vix serrato Dill. Hort. Elth. 25, pl. 21, fig. 22. 1732. Bromelia ananas var. δ . L. Sp. Pl. 285. 1753. Ananas erectifolius L. B. Smith, Bot. Mus. Leaflets, Harvard 7: 78, pl. 1. 1939; in J. L. Collins, The Pineapple 30, 31, 102, 104. 1960.

What I had supposed to be an Amazonian endemic, was already in the West Indies by the time of Plumier. Whether it was native there or brought by the Indians is uncertain, although probably the latter case.

BROMELIA

So many additions and corrections in the taxonomy and nomenclature of Bromelia have been discovered recently that this seems an appropriate time to summarize them in a brief revision.

1. Branches of the inflorescence distinct; flowers racemose.
2. Sepals broad, not more than 3 times as long as wide, 6-20 mm long.
3. Branches 13-24 cm long; inflorescence very lax, broadly pyramidal; pedicels 5-15 mm long, equaling or exceeding the floral bracts.
4. Inflorescence completely glabrous. Southern Bolivia, Paraguay, northwestern Argentina.....1. B. hieronymii
4. Inflorescence densely white-lepidote. Brazil: Rio de Janeiro.....2. B. binotii
3. Branches much shorter, rarely to 8 cm long (B. chrysantha), mostly erect or suberect; inflorescence mostly dense or subdense, narrow or short.
5. Inflorescence long, long-scapose, or mostly both.
6. Sepals narrowed from near the base, ovate or triangular.
7. Sepals 6 mm long, ecarinate. Brazil: Goiás.
3. B. irwinii
7. Sepals 10-15 mm long, carinate.
8. Petals to 35 mm long, twice as long as the sepals. Northeastern Brazil.....4. B. laciniosa
8. Petals 15-16 mm long, only a little longer than the sepals.

9. Sepals acuminate; inflorescence subglobose. Brazil: Goiás.....5. B. reversacantha
9. Sepals broadly acute; inflorescence laxly cylindric. Brazil: Bahia.....6. B. arenaria
6. Sepals narrowed from the middle or above or oblong.
10. Sepals ecarinate, muticous. Southern Brazil, Uruguay. 7. B. antiacantha
10. Sepals carinate.
11. Petal-blades erect, purple; sepals muticous. Brazil, Paraguay, Argentina.....8. B. balansae
11. Petal-blades spreading, yellow; sepals mucronate.
12. Inflorescence densely and persistently brown-lepidote. Trinidad, Venezuela, Colombia, Ecuador. 9. B. chrysantha
12. Inflorescence pale-brown-lepidote, soon glabrous. Mexico.....10. B. palmeri
5. Inflorescence densely ellipsoid to subglobose, short-scapose. Brazil: Minas Gerais.....11. B. regnellii
2. Sepals narrow, 4 or more times as long as broad.
13. Inflorescence white-lepidote, mostly 2 or more times longer than broad.
14. Sepals not prominently keeled, broadly convex to nearly flat.
15. Floral bracts subulate; petals densely tomentose at apex; sepals narrowly triangular, 6-10 times as long as wide; fruit verrucose. West Indies and Mexico to Guiana and Ecuador.....12. B. pinguin
15. Floral bracts broader; petals glabrous; sepals broader.
16. Floral bracts triangular; sepals straight. Mexico to Honduras.....13. B. alsodes
16. Floral bracts oblong, obtuse; sepals cucullate. Brazil: Maranhão.....14. B. eitenorum
14. Sepals prominently keeled, more or less conduplicate.
17. Branches of the inflorescence spreading; inflorescence subclax, pyramidal. Brazil: Mato Grosso. 15. B. sylvicola
17. Branches of the inflorescence erect; inflorescence densely cylindric or ellipsoid. Brazil, Paraguay, Argentina. 8. B. balansae
13. Inflorescence brown-lepidote.
18. Sepals free.
19. Floral bracts much shorter than the ovary; leaf-blades narrowed toward base but not truly petiolate. French Guiana.....16. B. gravifolia
19. Floral bracts from about equaling to much exceeding the ovary.
20. Pedicels slender, 10-12 mm long; inflorescence cylindric or subcylindric; sepals cucullate. Venezuela, Brazil: Pará.....17. B. goeldiana
20. Pedicels short but distinct; inflorescence densely capitate; sepals acute. Perú: San Martín. 18. B. poeppigii

18. Sepals irregularly high-connate; flowers lax, secund.
 Brazil: Amazonas.....19. B. epiphytica
1. Branches of the inflorescence abortive or the inflorescence simple (B. urbaniana); flowers fasciculate, all but their apices covered by the bracts.
21. Scape-bracts lax and exposing much of the scape. Brazil (?)
 20. B. redoutei
21. Scape-bracts densely imbricate and wholly concealing the scape or the scape lacking.
22. Inflorescence compound; sepals muticous.
23. Indument of the inflorescence white; leaf-blades neither constricted nor dilated at base; floral bracts equaling or exceeding the ovaries.
24. Sepals ecarinate, broadly convex to nearly flat, 15 mm long; inflorescence subcylindric. Brazil: Maranhão.
 14. B. eitenorum
24. Sepals carinate, more or less conduplicate.
25. Floral bracts linear to elliptic-oblong, not dilated at apex.
26. Scape present but sometimes covered by the leaf-sheaths
27. Sepals straight, acuminate, serrulate toward apex, 25-30 mm long. Brazil: Para.....21. B. legrellae
27. Sepals rounded or truncate, cucullate.
28. Inflorescence longer than broad; scape relatively long.
29. Inflorescence 7-9 cm thick; sepals mostly 20 mm long; filament-tube to 10 mm long. Brazil, Paraguay, Argentina.....8. B. balansae
29. Inflorescence 4 cm thick; sepals 12-15 (-20) mm long; filament-tube 5 mm long. Brazil: Goiás, Mato Grosso, São Paulo.....22. B. interior
28. Inflorescence globose or subcorymbose.
30. Sepals 30 mm long; filament-tube ca 18 mm long. Brazil: Goiás.....23. B. goyazensis
30. Sepals 15-20 mm long; filament-tube 5-6 mm long.
31. Flowers 50 mm long. Argentina, Bolivia, Paraguay, Brazil.....24. B. serra
31. Flowers 30 mm long. Brazil: Goiás.
 25. B. glaziovii
26. Scape wholly lacking.
32. Sepals oblong, 20-25 mm long. Trinidad, Venezuela.
 26. B. humilis
32. Sepals elliptic, 15 mm long. Brazil: Goiás.
 27. B. macedoi
25. Floral bracts dilated at apex.
33. Inflorescence on a distinct scape; sepals 20-22 mm long
34. Plant 2-3 m high; scape exerted above the leaf-sheaths. Brazil: Amazonas.....28. B. rondoniana
34. Plant 12 cm high; scape included in the leaf-sheaths. Brazil: Ceará.....29. B. auriculata
33. Inflorescence sessile; sepals 12 mm long. Brazil; Goiás.....30. B. exigua

23. Indument of the inflorescence some shade of brown.
35. Leaf-blade regularly narrowed from base to apex, linear-triangular.
36. Scape evident; sepals 14-24 mm long.
37. Floral bracts shorter than the ovary, entire; sepals 15 mm long. Brazil: Minas Gerais.....11. B. regnellii
37. Floral bracts exceeding the ovary, entire to lacinate-serrulate.
38. Inflorescence longer than wide, its indument very fine and filamentous. Brazil, Paraguay, Argentina.
8. B. balansae
38. Inflorescence globose or with a very broad apex, its indument coarse and ribbon-shaped.
39. Sepals obovate-oblong, broadly rounded, 20 mm long; floral bracts sublaciniate. Brazil: Minas Gerais, São Paulo.....31. B. lindmanii
39. Sepals oblong, acute, 25 mm long; floral bracts entire. Mexico, Central America.
32. B. hemispherica
36. Scape very short and hidden by the leaf-sheaths or completely lacking.
40. Indument of the inflorescence composed of very finely filamentous-divided scales.
41. Floral bracts shorter than the sepals. Perú: Loreto.
33. B. tarapotina
41. Floral bracts exceeding the sepals. Perú: San Martín.
18. B. poeppigii
40. Indument of the inflorescence composed of flat ribbon-like scales.
42. Sepals serrulate, 33 mm long. Colombia.
34. B. trianae
42. Sepals entire.
43. Sepals not over 17 mm long, oblong; indument pale. Brazil: Goiás, Mato Grosso.....35. B. villosa
43. Sepals 22-40 mm long.
44. Sepals cucullate, lance-oblong, 22 mm long, thin. Colombia.....36. B. fragilis
44. Sepals straight or nearly so, 25-40 mm long, coriaceous.
45. Sepals broadly elliptic, obtuse, soon glabrous; floral bracts greatly dilated at apex. Jamaica.
37. B. superba
45. Sepals narrowly oblong, acute or subacute, persistently dark-lepidote; floral bracts slightly dilated at apex.
46. Floral bracts narrowly obovate, widest well above the middle.
47. Floral bracts equaling or exceeding the sepals. Origin unknown.....38. B. grandiflora
47. Floral bracts distinctly exceeded by the sepals.
48. Ovary 2 cm long; sepals 25-27 mm long. Brazil: Bahia.....39. B. lagopus

48. Ovary to 8 cm long; sepals 30-40 mm long.
Mexico and the West Indies to Colombia and
Brazil.....40. B. plumieri
46. Floral bracts linear or narrowly lanceolate;
petals less than half connate. Colombia.
41. B. nidus-puellae
35. Leaf-blade either dilated or contracted at base, not
regularly triangular.
49. Leaf-blade abruptly dilated at base. Suriname.
42. B. fosteriana
49. Leaf-blade not dilated at base.
50. Leaf-blade abruptly contracted at base into a distinct
channeled petiole. Brazil: Pará.
51. Sepals free, linear, apiculate, 15 mm long, 3 mm wide;
petals glabrous, short-connate.....43. B. scarlatina
51. Sepals connate, oblong, obtuse, cucullate, 21 mm long,
7 mm wide; petals dark-lepidote, connate for 3/4 of
their length.....44. B. morreniana
50. Leaf-blades gradually contracted toward base, not truly
petiolate.
52. Sepals free.
53. Floral bracts much shorter than the ovary; scape
short and covered by the leaf-sheaths; pedicels
very short. French Guiana.....16. B. agavifolia
53. Floral bracts equaling or exceeding the ovary; scape
evident.
54. Pedicels obscure. Suriname.....45. B. alta
54. Pedicels slender, 10-12 mm long. Brazil: Pará.
55. Inflorescence cylindric, the lower fascicles
stipitate.....17. B. goeldiana
55. Inflorescence subglobose, the fascicles sessile or
nearly so.....46. B. oliveirae
52. Sepals irregularly high-connate, serrate at apex.
Venezuela: Amazonas.....47. B. tubulosa
22. Inflorescence simple; sepals spinose-mucronate.
Northwestern Argentina.....48. B. urbaniana

1. B. HIERONYMII Mez in Mart. Fl. Bras. 3, pt. 3: 199. 1891.
Type: Lorentz & Hieronymus s. n. Pl. I, fig. 3: Flower and bract
x 1.

2. B. BINOTII E. Morr. ex Mez in Mart. Fl. Bras. 3, pt. 3: 192
1891. Type: Binot s. n. B. fastuosa var. bergmannii Regel, Gar-
tenflora 15: 1, pl. 493. 1866. Type: Hort. St. Petersburg.

3. B. IRWINII L. B. Smith, sp. nov. A B. laciniosa Mart. ex
Schult., cui verisimiliter affinis, bracteis florigeris late
ovato-triangularibus brevioribusque, sepalis subduplo minoribus
ecarinatis differt.

PLANT flowering ca 75 cm high (! Irwin). LEAVES at least 37
cm long, not narrowed between sheath and blade; sheaths broadly
ovate-triangular, 4 cm wide, covered beneath with coarse oblong
brown scales; blades narrowly triangular, pungent, 17 mm wide,
covered with coarse appressed white scales, becoming glabrous

above, laxly serrate with antrorse and retrorse spines 3-4 mm long. SCAPE erect, 7 mm thick, covered with small finely divided crisped brown scales; scape-bracts erect and imbricate but narrow and exposing the scape, the lower subfoliaceous, the upper lance-ovate with a thick linear blade, rose-pink, subchartaceous when dry, covered beneath with appressed white scales. INFLORESCENCE laxly bipinnate, cylindric, 2 dm long, white-tomentulose with small finely divided scales; primary bracts like the upper scape-bracts but ovate, the lowest exceeding the flowers; branches short but distinct; floral bracts broadly ovate-triangular, several times shorter than the ovary; pedicels short and obscure. SEPALs free, ovate-triangular, obtuse, 6 mm long, ecarinate. PETALS imperfectly known; blades erect, ca 10 mm long. STAMENS with filament-tube 10 mm long. OVARY cylindric, 20 mm long, 2 mm thick. Pl. I, fig. 4: Primary bract and branch x 1; fig. 5: Sepal x 1.

BRAZIL: Goiás: Creek margin, among rocks, Chapada dos Veadeiros, ca 20 km west of Veadeiros, 14° S, 47° W, alt. 1000 m, 9 February 1966, H. S. Irwin et al. 12448 (NY, type).

4. B. LACINIOSA Mart. ex Schult. f. in R. & S. Syst. 7, pt. 2: 1278. 1830. Type: Martius 2228. B. antiacantha sensu Ant. Phyto-Icon. 32, pl. 20. 1884. Based on Hort. Vienna. Non Bertol. 1824. ? B. lanigera K. Koch ex Baker, Handb. Bromel. 26. 1889. Nomen. Pl. I, fig. 6: Flower x 1 (after Antoine).

5. B. REVERSACANTHA Mez in Mart. Fl. Bras. 3, pt. 3: 198. 1891. Type: Pohl 2205.

6. B. ARENARIA Ule, Bot. Jahrb. 42: 194. 1908. Type: Ule 7151. Pl. I, fig. 7: Flower x 1.

7. B. ANTIACANTHA Bertol. Virid. Bonon. 4. 1824; 4, Misc.: 6, pl. 1. 1844. B. acanga sensu Willd. Enum. Hort. Berol. 346. 1809. Based on: "Sp. Pl. ed. W. 2. p. 10." Non L. 1767. B. commeliniana de Vriese, Del. Sem. Hort. Amst. 1844 ex Hoev. & de Vriese, Tijdschr. 12: 49. 1845. Type: Hort. Amsterdam. B. sceptrum Penzl ex Huegel, Endlicher Parad. Vindob. 1: fasc. 8, 9: pl. 8. 1844-60. Nomen. Agallostachys antiacantha (Bertol.) Beer, Bromel. 37. 1857. A. commeliniana (de Vriese) Beer, op. c. 39. Bromelia fastuosa sensu Regel, Gartenflora 15: 1. 1866. Based on Hort. St. Petersburg. Non Lindl. 1821. B. pinguin sensu Carr. Rev. Hortie. 53: 153, fig. 35-39. 1831. Based on Hort. Brest. Non L. 1753. ? Hechtia longifolia hort. ex Baker, Handb. Brom. 140. 1889. Pl. I, fig. 8: Flower and bract x 1.

8. B. BALANSAE Mez in Mart. Fl. Bras. 3, pt. 3: 191. 1891. Type: Balansa 608.

Forma BALANSAE. B. laciniosa sensu Baker, Handb. Brom. 26. 1889, in part as to following: Karatas guianensis hort. ex Baker, l. c., fide Mez in DC. Mon. Phan. 9: 31. 1896, as "Bromelia guianensis". Bromelia argentina Baker, Kew Bull. 194. 1892. Type: Stewart s. n. (Actually from Paraguay, not Argentina. Not a combination on Rhodostachys argentina which is based on a different type). Bromelia pinguin sensu Morong & Britton, Ann. N. Y. Acad. Sci. 7: 235. 1892. Based on Morong 341. Non L. 1753. B. serra sensu Mez, Bull. Herb. Boiss. II, 3: 1035. 1903. Based on

Hassler 283. Non Griseb. 1879. Pl. I, fig. 9: Flower and bract x 1.

Forma TRICOLOR M. B. Foster, forma nov. A forma balansae foliorum laminis pulchre palido-striatis differt.

B. balansae var. tricolor hort. ex M. B. Foster, Bromel. Soc. Bull. 15: 127. 1965. Nomen.

SOUTH AMERICA: Cultivated, Jardin Botanique "Les Cèdres", St-Jean-Cap-Ferrat, France, 1966, J. Marnier-Lapostolle s. n. (US, type).

9. B. CHRYSANTHA Jacq. Hort. Schoenbrunn. 1: 28, Pl. 55. 1797. Type: Description and plate. Agallostachys chrysantha (Jacq.)

Beer, Brom. 38. 1857. Bromelia aurea Britton, Bull. Torrey Bot. Club 48: 328. 1921. Type: Britton et al. 2736. Pl. I, fig. 10: Flower and bract x 1.

10. B. PALMERI Mez in DC. Mon. Phan. 9: 40. 1896. Type: Palmer 1355. B. mucronata Mez, Bull. Herb. Boiss. II, 3: 131. 1903. Type: Langlasse 402-bis. Pl. I, fig. 11: Flower and bract x 1.

11. B. REGNELLII Mez in Mart. Fl. Bras. 3, pt. 3: 194, pl. 53. 1891. Type: Regnell III-285. B. pinguin sensu Lindm. Svensk. Akad. Handl. 24, no. 8: 22, pl. 8, fig. 1-8. 1891. Based on Regnell II-285. Pl. I, fig. 12: flower x 1 (after Mez).

12. B. PINGUIN L. Sp. Pl. 285. 1753. Type: Pinguin Dill., no Linnaean specimen found. Ananas americana sylvestris altera minor Pluk. Almag. Bot. Mant. 29, pl. 258. 1700. Pinguin Dill. Elth. 320, pl. 240, fig. 311. 1732. Bromelia foliis aculeatis, racemo laxo terminali L. Hort. Cliff. 129. 1737, in part, not as to Plumier reference. Ananas pinguin Trew, Ehret. pl. 51. 1750-53. Karatas pinguin Mill. Dict. ed. 8. 1768. Bromelia pinguin L. Mant. 362. 1771, error. ? B. sepiaria Hort. Lovan ex R. & S. Syst. 7, pt. 2: 1283. 1830. Nomen. ? B. acarna Thunb. ex R. & S. l. c. Nomen. B. ignea Beer, Brom. 35, 160. 1857. Based on Ananas pinguin Trew. Agallostachys pinguin (L.) Beer, Brom. 36. 1857. Karatas pinguin Mill. ex Baker, Handb. Brom. 25. 1889. Nomen. K. plumieri Devan. ex Baker, l. c. Nomen. Bromelia paraguayensis Baker, op. c. Nomen, based on Morren Icon. Pl. I, fig. 13: Flower and bract x 1.

13. B. ALSODES St. John, Taxon 14: 29. 1965. B. sylvestris Willd. ex Link, Enum. 1: 308. 1821. Type: Hort. Berlin. Non Burm. f. 1768. Agallostachys sylvestris (Willd. ex Link) Beer, Brom. 35. 1857. A. lanigera K. Koch ex Baker, Handb. Brom. 26. 1889, fide Mez, Pflanzenreich IV. 32: 34. 1934. Nomen. Pl. I, fig. 14: Flower and bract x 1.

14. B. EITENORUM L. B. Smith, Phytologia 13: 458, pl. 1, fig. 15, 16. 1966. Type: G. & L. T. Eiten 4312. Pl. I, fig. 15: Flower and bract x 1.

15. B. SYLVICOLA S. Moore, Trans. Linn. Soc. ser. II. 4: 490. 1895. Type: S. Moore 489. Pl. I, fig. 16: Flower and bract x 1.

16. B. AGAVIFOLIA Brongn. ex Houliet, Rev. Hort. 47: 247. 1875. Type: Hort. Paris. Karatas agavifolia (Brongn. ex Houliet) Devans. Rev. Hort. 50: 190. 1878. Bromelia agavoides Carr. Rev. Hort. 53: 31. 1881. Type: Hort. Mus. Paris.

17. *B. GOELDIANA* L. B. Smith, Bol. Mus. Paraense Emilio Goeldi n. ser. no. 1: 7, fig. 2-3. 1954. Type: Ducke s. n. *B. karatas*-*bensis* L. B. Smith, Phytologia 13: 140, pl. 7, fig. 1. 1966. Type: Bockermann 1894. Pl. I, fig. 17: Sepal x 1.

18. *B. POEPPIGII* Mez in Mart. Fl. Bras. 3, pt. 3: 188. 1891. Type: Poeppig 1824.

19. *B. EPIPHYTICA* L. B. Smith, Bol. Mus. Paraense Emilio Goeldi (n. ser.) no. 12: 1, pl. 1961. Type: Fröes 33822. Pl. I, fig. 18: Sepals x 1.

20. *B. REDOUTEI* (Baker) L. B. Smith, Phytologia 13: 140. 1966. *B. karatas* var. *caulescens* Redouté, Lil. 6: pl. 457. 1816. Type: Description and plate. *Karatas redoutei* Baker, Handb. Brom. 3, 1889. Based on Redouté, Lil. 6: pl. 457. *Bromelia caulescens* Kuntze, Rev. Gen. 3, pt. 2: 302. 1898. Nomen, in synonym. Pl. I, fig. 19: Flower and bract x 1 (after Redouté).

21. *B. LEGRELLAE* (E. Morr.) Mez in Mart. Fl. Bras. 3, pt. 3: 184. 1891. *Karatas legrellae* E. Morr. Belg. Hort. 22: 122, pl. 11-13. 1872. Type: Hort. Linden. Pl. II, fig. 1: Floral bract x 1; fig. 2: Flower x 1 (after Belg. Hort.).

22. *B. INTERIOR* L. B. Smith, Smithsonian Misc. Coll. 126: 23, 176, fig. 80. 1955. Type: Macedo 3260. Pl. II, fig. 3: Flower x 1.

23. *B. GOYAZENSIS* Mez, Bot. Jahrb. 30, Beibl. 67: 2. 1901. Type: Glaziou 22190. *B. balansae* sensu L. B. Smith, Smithsonian Misc. Coll. 126: 175. 1955. In part, as to synonym.

24. *B. SERRA* Griseb. Symb. Argent. in Goett. Abh. 24: 328. 1879. Type: Lorentz & Hieronymus s. n.

Forma *SERRA*. *Rhodostachys argentina* Baker, Handb. Brom. 3, 1889. Type: Harman s. n. Leaf-blades concolorous. Pl. II, fig. 4: Flower and bract x 1 (after Castellanos).

Forma *VARIEGATA* (M. B. Foster) M. B. Foster ex L. B. Smith, stat. nov. *B. serra* var. *variegata* M. B. Foster, Bromel. Soc. Bull. 5: 61, fig. 1955. Leaf-blades white-striped.

25. *B. GLAZIOVII* Mez, Bot. Jahrb. 30, Beibl. 67: 1. 1901. Type: Glaziou 22132. Doubtfully distinct from *B. serra* Griseb.

26. *B. HUMILIS* Jacq. Enum. Vindob. App. 306. 1762; Ic. Pl. Rar. 1: pl. 60. 1734. Type: Hort. Vienna. *B. karatas* sensu HBK. Nov. Gen. & Sp. 1: 227. 1816. Based on Humboldt & Bonpland s. n. *B. lasiantha* Willd. ex Schult. f. as synonym. *Puya lanata* Schult. f. in R. & S. Syst. 7, pt. 2: 1233. 1830. *Nidularium humile* (Jacq.) Regel, Gartenflora 17: 69. 1868. *Karatas humilis* (Jacq.) E. Morr. Belg. Hort. 22: 131. 1872. *Madragia humilis* Liebm. ex Ant. Phyto-Icon. 35. 1884. Nomen in synonym. *Bromelia lasiantha* Willd. ex Mez in DC. Mon. Phan. 9: 28. 1896. Type: Humboldt & Bonpland s. n. *Karatas lasiantha* (Willd. ex Mez) Harms, Pflanzensfam. ed. 2, 15a: 135. 1930. Pl. II, fig. 5: Flower and bract x 1.

27. *B. MACEDOII* L. B. Smith, Bromel. Soc. Bull. 8: 12, fig. 1956. Type: Smith & Macedo 4626. Pl. II, fig. 6: Flower and bract x 1.

28. *B. RONDONIANA* L. B. Smith, Bol. Mus. Nac. Rio de Janeiro n. ser. no. 15: 1, fig. a, b. 1952. Type: Luetschburg in Rondon

21278. Pl. II, fig. 7: Sepal x 1.

29. *B. AURICULATA* L. B. Smith, sp. nov. A *B. exigua* Mez, cui verisimiliter affinis, scapo brevi sed distincto, bractearum scapi atque primarium vaginis apice auriculatis, sepalis majoribus differt.

PLANT flowering only about 12 cm high. LEAVES to 7 dm long; sheaths broadly ovate, 3 cm long, castaneous, covered beneath toward apex with oblong brown retrorse-spreading scales, elsewhere glabrous, spinulose-serrate toward apex; blades linear, acuminate to a small rounded-apiculate apex, 8 mm wide, antorsely serrate at base with spines 3 mm long, retrorsely above, sparsely pale-lepidote on both sides except at base where densely vestite like sheath. SCAPE to 4 cm long; scape-bracts narrowly obovate with large apical auricles, densely serrulate, thin, covered beneath with pale appressed scales, shorter than the flowers but their foliaceous blades much exceeding them. INFLORESCENCE densely corymbiform, 4-5 cm in diameter, pale-lepidote; primary bracts like the scape-bracts but with shorter blades; floral bracts subclavate with an elliptic-dilated thickened serrulate apex, exceeded by the sepals. FLOWERS obscurely short-pedicellate; sepals free, linear, 20 mm long, cucullate and serrulate at apex, conduplicate, somewhat glabrescent and contrasting with the ovary; petals narrowly ligulate without a distinct blade, pale-lepidote near apex; filament-tube 18 mm long; ovary slenderly cylindric, covered with fine pale spreading scales. Pl. II, fig. 8: Primary bract x 1/2; fig. 9: Floral bract x 1; fig. 10: Sepal x 1.

BRAZIL: CEARÁ: Grangeiro, taboleiros, 10 January 1934, Luetzelburg 25990 (M, type; phot. US).

30. *B. EXIGUA* Mez, Bot. Jahrb. 30, Beibl. 67: 2. 1901. Type: Glaziou 22192.

31. *B. LINDMANII* Mez in Mart. Fl. Bras. 3, pt. 3: 621. 1894. Karatas laciniosa Lindm. Svensk. Akad. Handl. 24, no. 8: 18, pl. 2, fig. 22-25. 1891. Type: Regnell III-1258. Non *Bromelia laciniosa* Mart. 1830. Pl. II, fig. 11: Floral bract x 1; fig. 12: Flower x 1; fig. 13: Sepal x 1 (after Lindman).

32. *B. HEMISPHERICA* Lam. Encycl. 1: 145. 1783. Mexocotl seu Manguei Hernandez, Nov. Pl. An. Min. Mex. 272. 1651. Aloë Americana fructu dulci & acido multiplici prunis simili Morison, Pl. Hist. 2: 418, sec. 4, pl. 22, fig. 7. 1715. *Bromelia acanga* L. Syst. Nat. ed. 12. 2: 232. 1767, as to above synonyms, but not as to type which is some species with a long inflorescence. *B. humilis* sensu Mez in DC. Mon. Phan. 9: 25, 1896, in part, as to above synonyms. *B. wercklei* Mez, Fedde Rep. Spec. Nov. 16: 2. 1919. *B. tejupilcana* Matuda, Anal. Inst. Biol. Mex. 27: 353, fig. 8, 9. 1957. Pl. II, fig. 14: Sepal (ventral) x 1.

The floral bracts would appear to be entire and not laciniate-serrate as Mez described those of *B. wercklei*. The primary bracts are laciniate-serrate and these must have been intended by Mez.

33. *B. TARAPOTINA* Ule, Verhandl. Bot. Ver. Brandenb. 48: 130. 1907. Type: Ule 6682.

34. *B. TRIANAE* Mez in Mart. Fl. Bras. 3, pt. 3: 523. 1894. Nomen; in DC. Mon. Phan. 7: 21. 1896. Type: *Triana* 522 (number 1800, cited by Mez in parentheses, is the number of the genus in the system used by Triana and not a collection number). Pl. II, fig. 15: Floral bract x 1; fig. 16: Flower x 1; fig. 17: Sepal x 1.
35. *B. VILLOSA* Mez, Bot. Jahrb. 30, Beibl. 67: 3. 1901. Type: Glaziou 22191. Pl. II, fig. 18: Sepal (ventral) x 1.
36. *B. FRAGILIS* L. B. Smith, Contr. U. S. Nat. Herb. 29: 285, fig. 10. 1940. Type: Foster & Smith 1465. Pl. II, fig. 19: Sepal x 1.
37. *B. SUPERBA* Mez, Symb. Ant. 2: 252. 1900. Type: Harris Jam. 5170. Pl. II, fig. 20: Flower and floral bract x 1.
38. *B. GRANDIFLORA* Mez, Fedde Rep. Spec. Nov. 16: 3. 1919. Type: Hort. Kamerun. Doubtfully distinct from *B. plumieri* (E. Morr.) L. B. Smith.
39. *B. LAGOPUS* Mez in Mart. Fl. Bras. 3, pt. 3: 188. 1891. Type: E. Morren s. n. Probably only a small form of *B. plumieri* (E. Morr.) L. B. Smith.
40. *B. PLUMIERI* (E. Morr.) L. B. Smith, comb. nov. Karatas plumieri E. Morr. Belg. Hort. 22: 131. 1872. Nom. nov. for Bromelia karatas L. in part, not as to type.
- Caraguata acanga Piso, Hist. Nat. Bras. 88. 1648. Karatas foliis altissimis angustissimis et aculeatis Plum. Gen. 10, pl. 33. 1703. Bromelia karatas L. Sp. Pl. 285. 1753, in part, as to questioned synonym above, not as to type described as {"...panicula diffusa"}; sensu Jacq. Hort. Vindob. 1: pl. 31, 32. 1770. B. nudicaulis var. B. caraguata Lam. Encycl. 1: 146. 1783. B. acaulis Stokes, Bot. Mat. Med. 2: 204. 1812, in part, as to description, but nomen illegitimum because of the inclusion of *B. karatas* L. in its synonymy. Nidularium karatas Lem. ex Griseb. Fl. Brit. W. Ind. 591. 1864, in part, as to description. Pl. II, fig. 21: Sepal (ventral) x 1.
- This common widespread species with a sessile densely corymbose inflorescence, has always gone under the name of Bromelia karatas L., although Linnaeus described it as having "panicula diffusa". He later tried to substitute the name, B. acanga, for the diffuse element in order to save B. karatas for the sessile but only succeeded in adding one more name to limbo. With the help of Dr. William T. Stearn of the British Museum, I also tried to salvage the old familiar name but had to agree with his conclusion that this course was impossible.
41. *B. NIDUS-PUELLAE* (André) André ex Mez in DC. Mon. Phan. 9: 22. 1896. Karatas nidus-puellae André, Enum. Bromél. 3. Dec. 13, 1888; Rev. Hort. 60:563. Dec. 16, 1888; Brom. Andr. 1, pl. 1. 1889. Pl. II, fig. 22: Floral bract x 1/2 (after André).
42. *B. FOSTERIANA* L. B. Smith, Act. Bot. Neerlandica 5: 91, fig. 2 d-g. 1956. Pl. II, fig. 23: Sepals (ventral) x 1.
43. *B. SCARLATINA* (hort. ex Herincq) E. Morr. Belg. Hort. 31: 164. 1881; Mez in Mart. Fl. Bras. 3, pt. 3: 187, pl. 52. 1891. Distiacanthus scarlatinus hort. ex Herincq, Hort. Français 246. 1869. Type: Hort. Paris. Disteganthus scarlatinus Nicholson,

Dict. Gard. 1: 485. 1885 (not a combination). Bromelia amazonica hort. ex Nicholson, l. c. Nomen. Karatas scarlatina (hort. ex Herincq) Harms, Pflanzenfam. ed. 2, 15a: 135. 1930.

44. B. MORRENIANA (Regel) Mez in Mart. Fl. Bras. 3, pt. 3: 186. 1891. Cryptanthus morrenianus Regel, Gartenflora 37: 157. 1888. Type: Hort. St. Petersburg ex Hort. Liège. Disteganthus moensi hort. ex Regel, l. c. Nomen. Distiacanthus morrenianus (Regel) Baker, Handb. Brom. 14. 1889. Bromelia moensis E. Morr. ex Baker, l. c. Nomen.

45. B. ALTA L. B. Smith, Act. Bot. Neerlandica 5: 91, fig. 2 a-c. 1956. Type: Foster 2378. Pl. II, fig. 24: Sepal x 1.

46. B. OLIVEIRAE L. B. Smith, Phytologia 13: 149, pl. 7, fig. 7. 1966. Type: E. Oliveira 518. Pl. II, fig. 25: Sepal x 1.

47. B. TUBULOSA L. B. Smith, Mem. N. Y. Bot. Gard. 10, no. 5: 40, fig. 28. 1964. Type: Wurdack & Adderley 43525. Pl. II, fig. 26: Sepals x 1.

48. B. URBANIANA (Mez) L. B. Smith, comb. Nov. Rhodostachys urbaniana Mez in Mart. Fl. Bras. 3, pt. 3: 182, pl. 81. 1891. Deinacanthos urbanianum (Mez) Mez in DC. Mon. Phan. 9: 13. 1896; Castellanos, Gen. & Sp. Pl. Argent. 3: 154, pl. 28. 1945. Pl. III, fig. 1: Flower and bract x 1; fig. 2: Petals and stamens x 1 (after Castellanos).

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ANANAS americana etc. 12; pinguin 12.

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"laciniosa" Baker 8; laciniosa Mart. 4; lagopus 39; lanigera 4; lasiantha 26; legrellae 21; lindmanii 31.

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plumieri 40; poeppigii 18.

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"serra" Mez 8; superba 37; sylvestris Willd. ex Link. 13;

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APPENDIX

(Doubtful and excluded taxa)

acanga L. Syst. Nat. ed. 12. 2: 232. 1767. Nomen illegitimum, because B. karatas included in its synonymy. An unsuccessful attempt by Linnaeus to save the name karatas for the species with a sessile inflorescence.

acanga sensu Schult. f. in R. & S. Syst. 7, pt. 2: 1281. 1830 = ARAEOCOCCUS MICRANTHUS Brongn.

albo-bracteata Steud. in Lechler, Bearb. Am. Austr. 53. 1857. Nomen = FASCICULARIA BICOLOR (R. & P.) Mez

albo-rosea Lem. Ill. Hort. 2, Misc.: 64. 1855 = ? AECHMEA PURPUREA-ROSEA (Hook.) Wawra.

amazonica hort. ex Andre, Rev. Hort. 58: 503. 1886. Nomen = WITTROCKIA AMAZONICA (Baker) L. B. Smith.

ananas L. Sp. Pl. 285. 1753 = ANANAS COMOSUS (L.) Merrill.

angustifolia Baker, Handb. Brom. 4. 1889. Erroneously attributed to K. Koch = Billbergia angustifolia K. Koch = NEOREGELIA CYANEA (Beer) L. B. Smith.

aquilega Salisb. Parad. pl. 40. 1806 = GRAVISIA AQUILEGA (Salisb.) Mez.

arvensis Vell. Fl. Fluminensis 130. 1825; Icon. 3: pl. 114. 1835 = QUESNELIA ARVENSIS (Vell.) Mez.

aurantiaca Burchell ex Baker, Journ. Bot. 17: 231. 1879. Nomen = NIDULARIUM BURCHELLII (Baker) Mez.

bicolor R. & P. Fl. Per. 3: 33. 1802 = FASCICULARIA BICOLOR

(R. & P.) Mez.

blanda Schott ex Beer, Brom. 43. 1857 = *QUESNELIA BLANDA* (Schott ex Beer) Mez.

bracteata sensu Ait. Hort. Kew. ed. 2, 2: 201. 1811. Non Sw. 1788 = *GRAVISIA AQUILEGA* (Salisb.) Mez.

bracteata Sw. Prodr. 56. 1788 = *AECHMEA BRACTEATA* (Sw.) Gris.

capituligera E. Morr. Belg. Hort. 29: 352. 1879. Incorrectly attributed to Reichenb. = *GRAVISIA AQUILEGA* (Salisb.) Mez.

caratas Hill, Veg. Syst. 7: 19. 1764 = *BROMELIA KARATAS* L.

carnea Beer, Brom. 31. 1857 = *OCHAGAVIA CARNEA* (Beer) Smith & Looser.

carolinae Beer, Brom. 29. 1857 = *NEOREGELIA CAROLINAE* (Beer) L. B. Smith.

clandestina hort. ex Carr. Rev. Hort. 52: 256. 1880. Nomen = *GREIGIA SPHACELATA* (R. & P.) Regel.

comata (Vell.) Beer, Brom. 34. 1857 = *Tillandsia comata* Vell. = *AECHMEA* species.

communis Lam. Illustr. 2: pl. 223, fig. 1. 1793 = *ANANAS COMOSUS* (L.) Merrill.

comosa L. Herb. Amboin. 21. 1754; Amoen. Acad. 4: 130. 1759 = *ANANAS COMOSUS* (L.) Merrill.

concentrica (Vell.) Beer, Brom. 29. 1857 = *NEOREGELIA CONCENTRICA* (Vell.) L. B. Smith.

crassa Steud. in Lechler, Bearb. Am. Austr. 53. 1857. Nomen = *GREIGIA SPHACELATA* (R. & P.) Regel.

cruenta R. Graham, Edinb. Journ. 174. 1828 = *NEOREGELIA CRUENTA* (R. Graham) L. B. Smith.

daguensis Carr. Rev. Hort. 53: 230. 1881 = *AECHMEA GERMINYANA* (Carr.) Baker.

denticulata K. Koch, Wochenschr. 2: 151. 1859 = *NEOREGELIA CYANEA* (Beer) L. B. Smith.

desmetiana Baker, Bot. Mag. 120: pl. 7340. 1894. In synon. = *HECHTIA DESMETIANA* (Baker) Mez.

discolor Lindl. Bot. Reg. 24, Misc.: 48. 1838 = *GREIGIA SPHACELATA* (R. & P.) Regel.

edulis Salisb. Prodr. 247. 1796 = *ANANAS COMOSUS* (L.) Merrill.

elegans hort. Hamburg ex R. & S. Syst. 7, pt. 2: 1238. 1830. Nomen = ?

exsudans Lodd. Bot. Cab. 9: pl. 801. 1824 = *GRAVISIA AQUILEGA* (Salisb.) Mez.

fastuosa Lindl. Collect. pl. 1. 1821. Identity dubious.

Possible equivalents are *B. laciniosa* Mart. ex Schult. f., *B. antiacantha* Bertol. and *B. alsodes* St. John. However, *B. fastuosa* shows enough differences so that it might be a distinct species.

fernandae E. Morr. Ill. Hort. 18: 114, pl. 65. 1871 = *AECHMEA FERNANDAE* (E. Morr.) Baker.

foliis margine dorsoque aculeatis, caule sulcato spinoso L.

Fl. Ceyl. 54. 1747 = *PANDANUS ODORATISSIMUS* L. f. (Pandanaeae).

foliis radicalibus etc. Plum. Pl. Amer. ed. Burm. 52, pl. 63. 1755-60 = *PITCAIRNIA SPICATA* (Lam.) Mez

foliis serrato-spinosis etc. Plum. Pl. Amer. ed. Burm. 53, pl. 64, fig. 1. 1755-60 = *AECHMEA LINGULATA* (L.) Baker.

- Foliis spinosis etc. L. Hort. Cliff. 177. 1777 = ANANAS COMOSUS (L.) Merrill.
- gigantea hort. ex R. & S. Syst. 7, pt. 2: 1283. 1830. Nomen = ? AECHMEA NUDICAULIS (L.) Griseb.
- glabra Schult. f. in R. & S. Syst. 7, pt. 2: 1286. 1830 = ANANAS LUCIDUS Mill.
- glabra folio vix serrato Boerh. Ind. Alt. 2: 23. 1760 = ANANAS LUCIDUS Mill.
- hookeri Sweet, Hort. Brit. 429. 1826 = AECHMEA NUDICAULIS (L.) Griseb. var. CUSPIDATA Baker.
- incarnata R. & P. Fl. Peruv. 3: 32, pl. 255. 1802 = BILLBERGIA INCARNATA (R. & P.) Schult. f.
- inermis Steud. Nomencl. ed. 2, 1: 226. 1841 = ANANAS LUCIDUS Mill.
- iridifolia Nees & Mart. Nova Acta Acad. Leop. Carol. 11: 16. 1823 = BILLBERGIA IRIDIFOLIA (Nees & Mart.) Lindl.
- itatiaiae Wawra, Oesterr. Bot. Zeitschr. 30: 114. 1880 = FERNSSEEA ITATIAIAE (Wawra) Baker.
- joinvillei E. Morr. Belg. Hort. 26: 161, pl. 10, 11. 1876 = FASCICULARIA PITCAIRNIIIFOLIA (Hort. Berlin ex Verlot) Mez.
- karatas L. Sp. Pl. 285. 1753, in part as to type, a species with "panicula diffusa". Identity wholly uncertain.
- laevis Hort. Carlsr. ex R. & S. Syst. 7, pt. 2: 1238. 1830. Nomen = BILLBERGIA AMOENA (Lodd.) Lindl.
- landbeckii Lechler ex Phil. Linnaea 33: 246. 1864-65 = GREIGIA LANDBECKII (Lechler ex Phil.) Phil.
- lanuginosa Beer, Brom. 32. 1857 = PUYA LANUGINOSA (R. & P.) Schult. f.
- latifolia Willd. ex Schult. f. in R. & S. Syst. 7, pt. 2: 1283. 1830 = AECHMEA LATIFOLIA (Willd. ex Schult. f.) Kl. ex Baker
- lindleyana Lem. Jard. Fleur. 3: pl. 223. 1852-53 = OCHAGAVIA CARNEA (Beer) Smith & Looser, ARAEOCOCCUS MICRANTHUS Brongn.
- lingulata L. Sp. Pl. 285. 1753 = AECHMEA LINGULATA (L.) Baker.
- linifera hort. ex Beer, Brom. 38. 1857. Nomen = NEOGLAZIOVIA VARIEGATA (Arr. Cam.) Mez.
- longifolia Lindl. in Paxton, Fl. Gard. 2: pl. 65. 1851 = OCHAGAVIA CARNEA (Beer) Smith & Looser.
- longifolia Rudge, Guyen. 1: 31, pl. 42. 1805 = STREPTOCALYX LONGIFOLIA (Rudge) Baker.
- longifolia Rich. Schomburgk, Reise 3: 203. 1843. Nomen = AECHMEA FERNANDAE (E. Morr.) Baker.
- longissima Posada, Estudios Cient. 241. 1909. Nomen subnudum = AECHMEA MAGDALENAE (André) André ex Baker.
- lucida Willd. Enum. 345. 1809 = ANANAS LUCIDUS Mill.
- lutea G. Meyer, Fl. Esseq. 145. 1818 = AECHMEA NUDICAULIS (L.) Griseb. var. CUSPIDATA Baker.
- macrocosa hort. ex E. Morr. Belg. Hort. 28: 140. 1878. Nomen = PSEUDANANAS SAGENARIUS (Arr. Cam.) Camargo.
- margalenae (André) C. H. Wright, Kew Bull. 1923: 267. 1923 = AECHMEA MAGDALENAE (André) André ex Baker.
- marmorata Brongn. ex Baker, Handb. Brom. 11. 1882. Nomen =

NEOREGELIA MARMORATA (Baker) L. B. Sm th.

melanantha Ker, Bot. Reg. 9: pl. 766. 1824 = AECHMEA BROMELIIFOLIA (Rudge) Baker.

mertensii G. Meyer, Fl. Esseq. 144. 1818 = AECHMEA MERTENSII (G. Meyer) Schult. f.

mexicana Nois. ex R. & S. Syst. 7, pt. 2: 1238. 1830. Nomen = ?

muricata Arr. Cam. Diss. Pl. Brasil. 21. 1810 = AECHMEA MURICATA (Arr. Cam.) L. B. Smith.

nitens hort. ex Rev. Hort. 66: 118. 1894. Nomen = NIDULARIUM FULGENS Lem.

nudicaulis sensu Edwards, Bot. Reg. 3: pl. 203. 1817 = BILLBERGIA PYRAMIDALIS (Sims) Lindl. var. PYRAMIDALIS.

nudicaulis L. Sp. Pl. 286. 1753 = AECHMEA NUDICAULIS (L.) Griseb.

nudicaulis var. β. caraguata Lam. Encycl. 1: 146. 1783 = ? GRAVISIA AQUILEGA (Salisb.) Mez.

pallida Ker, Bot. Reg. 4: pl. 344. Dec. 1818 = BILLBERGIA AMOENA (Lodd.) Lindl. var. AMOENA.

paniculata Gmel. Syst. 2: 529. 1796 = AECHMEA PANICULIGERA (Sw.) Griseb.

paniculata Steud. Nomencl. ed. 2, 1: 226. 1840 = AECHMEA PANICULIGERA (Sw.) Griseb.

paniculigera sensu Reichenb. Icon. Exot. 3: 14, pl. 239, 240. 1827-30 = GRAVISIA AQUILEGA (Salisb.) Mez.

paniculigera Sw. Prodr. 56. 1788 = AECHMEA PANICULIGERA (Sw.) Griseb.

pauciflora K. Koch, Wochenschr. 9: 183. 1866 = NEOREGELIA CYANEA (Beer) L. B. Smith.

pearcei anonymous ex Baker, Handb. Brom. 13. 1889. Nomen = GREIGIA PEARCEI Mez.

perigrina Frag. & Cif. Bol. Real Soc. Españ. Hist. Nat. 25: 449. 1925. Nomen = ?

pitcairniifolia (Hort. Berlin ex Verlot) K. Koch, Wochenschr. 11: 325. 1868 = FASCICULARIA PITCAIRNIIFOLIA (Hort. Berlin ex Verlot) Mez.

pumila hort. ex Otto & Dietr. Allg. Gartenzeit. 4: 244. 1836. Nomen = CRYPTANTHUS ACAULIS (Lindl.) Beer var. ARGENTEUS Beer.

pyramidalis Sims, Bot. Mag. 42: pl. 1732. 1815 = BILLBERGIA PYRAMIDALIS (Sims) Lindl.

pyramidata (R. & P.) Beer, Brom. 34. 1857 = PUYA PYRAMIDATA (R. & P.) Schult. f.

pyramidata aculeis nigris etc. Plum. Gen. 46. 1703; Pl. Amer. ed. Burm. 51, pl. 62. 1756 = AECHMEA NUDICAULIS (L.) Griseb. var. NUDICAULIS.

pyramidata foliorum etc. Plum. ms. 5: pl. 59. fide Lam. = PITCAIRNIA SPICATA (Lam.) Mez.

ramosa et racemosa etc. Plum. Gen. 46. 1703 = AECHMEA LINGULATA (L.) Baker.

ramosissima fol. variegatis et circinatis Mez, Pflanzenreich IV. 32: 406. 1935. Error for Renealmia ramosissima etc. Plum. Gen. 27. 1703 = TILLANDSIA PANICULATA L.

- rhodocincta Brongn. ex Baker, Handb. Brom. 11. 1859 = NEOREGELIA CAROLINAE (Beer) L. B. Smith, fide Mex as Aregelia.
- rohaniana Walp. Anal. 6: 71. 1861. Erroneously attributed to de Vriese = BILLBERGIA VITTATA Brongn. ex Morel.
- rubra hort. ex R. & S. Syst. 7, pt. 2: 1285. 1830. Nomen = ANANAS COMOSUS (L.) Merrill.
- sagenaria Arr. Cam. Diss. Pl. Brasil. 13. 1810 = PSEUDANANAS SAGENARIUS (Arr. Cam.) Camargo.
- semiserrata Willd. Enum. 745. 1807 = ANANAS COMOSUS (L.) Merrill form.
- sessiliflora Lodd. ex Loud. Hort. Brit. 118. 1800 = CATOPSIS SESSILIFLORA (R. & P.) Mez.
- silvestris Vell. Fl. Flum. 129. 1825; Icon. 3: pl. 113. 1835 = PSEUDANANAS SAGENARIUS (Arr. Cam.) Camargo.
- silvestris, cf. also syvestris.
- sphacelata R. & P. Fl. Peruv. 3: 32. 1802 = GREIGIA SPHACELATA (R. & P.) Regel.
- spicata Lam. Encycl. 1: 146. 1783 = PITCAIRNIA SPICATA (Lam.) Mez.
- strobilina Beurl. Svensk. Vet Handl. 1854: 110. 1854 ("spicarum squamis.....distiche imbricatis") = AECHMEA species.
- subspinosa Wendl. ex R. & S. Syst. 7, pt. 2: 1286. 1830 = ANANAS COMOSUS (L.) Merrill.
- surinamensis Miq. Linnaea 18: 378. 1844 = GRAVISIA AQUILEGA (Salisb.) Mez.
- sylvestris Burm. f. Fl. India 79. 1768 = PANDANUS ODORATISSIMUS L. f. (Pandanaeae).
- thyrsiflora Willd. ex Schult. f. in R. & S. Syst. 7, pt. 2: 1282. 1830 = AECHMEA MERTENSII (G. Meyer) Schult. f.
- tinctoria Mart. ex Spix & Mart. Reise in Brasilien 2: 554. 1828 = AECHMEA BROMELIIFOLIA (Rudge) Baker.
- tricolor hort. ex Gard. Chron. 43: 257. 1908 = BROMELIA species (sterile) and GUZMANIA MONOSTACHIA (L.) Rusby ex Mez, fide Mez, Pflanzenreich IV. 32: 35. 1934; 612. 1935.
- tristis Beer, Brom. 30. 1857 = NEOREGELIA TRISTIS (Beer) L. B. Smith.
- undulata hort. ex E. Morr. Belg. Hort. 28: 140. 1878. Nomen = PSEUDANANAS SAGENARIUS (Arr. Cam.) Camargo.
- variegata Arr. Cam. Diss. Pl. Brasil. 7. 1810 = NEOGLAZIOVIA VARIEGATA (Arr. Cam.) Mez.
- violacea hort. ex R. & S. Syst. 7, pt. 2: 1285. 1830 = ANANAS COMOSUS (L.) Merrill.
- zebrina Herb. Bot. Mag. 53: pl. 2686. 1826 = BILLBERGIA ZEBRINA (Herb.) Lindl.

CATOPSIS

- CATOPSIS PANICULATA E. Morr. in Makoy Cat. Hort. no. 121. Oct. 1883. C. pendula Baker, Handb. Brom. 155. 1889.
- MEXICO: Sept. 1881, Morren Icon. (K, type of C. pendula Baker, and probably painted from the original plants of C. paniculata E. Morr.; phot. US).

I was able to verify the publication of Catopsis paniculata E. Morr. in the rich collection of old horticultural catalogues at the Jardin Botanique de l'État at Bruxelles. The reference includes an adequate description but no citation, so it is quite valid since the International Code bars publication in catalogues only after 1953 and without indication of type only after 1957.

GUZMANIA

GUZMANIA SQUARROSA (Mez & Sodiro) Sm. & Pitt. Journ. Wash. Acad. Sci. 43: 403. 1953. Thecophyllum squarrosum Mez & Sodiro, Bull. Herb. Boiss. II. 4: 877. 1904. Guzmania cryptantha L. B. Smith, Caldasia [1], no. 5: 6, fig. 2. 1942; Contr. U. S. Nat. Herb. 33: 225. 1957.

COLOMBIA: HUILA-CAQUETÁ: Gabinete, crest of the Cordillera Oriental, alt. 2300-2450 m, 22 March 1940, Cuatrecasas 8472 (US, type of Guzmania cryptantha L. B. Smith).

ECUADOR: "in silv. occident.", Pichincha, January 1901, Sodiro 47 (B, type of Thecophyllum squarrosum Mez & Sodiro; phot. US).

NEOREGELIA

Twenty years after Mez made his final revision of this genus as Aregelia in the "Pflanzenreich", I treated it in my "Bromeliaceae of Brazil" (Smithsonian Misc. Coll. 126: 144. 1955). However, in just a dozen years this treatment has become badly out of date. It is almost certain that more new species will be discovered in the next few years, but at least I can improve the understanding of those already known.

1. Petals connate; pedicels usually distinct (obscure in N. laevis) and making a sharp contrast with the base of the stout ovary. Eastern Brazil.....Subgenus NEOREGELIA
2. Inflorescence compound, its axes ferruginous-lepidote; floral bracts about equaling the sepals, serrulate; sepals 15 mm long. Rio de Janeiro.....1. N. fosteriana
2. Inflorescence simple.
3. Inner leaves of the rosette evenly bright red, unlike the outer.
4. Leaf-blades covered at least beneath with appressed cinereous scales; sepals acuminate.
5. Leaf-blades about 15 mm wide; floral bracts serrulate. State (?).....2. N. pineliana
5. Leaf-blades to 40 mm wide; floral bracts entire.
6. Sepals to 38 mm long; pedicels to 30 mm long. Espirito Santo.....3. N. macrosepala
6. Sepals 24-27 mm long; pedicels 5-16 mm long.
7. Floral bracts and sepals red; pedicels 5 mm long, exceeding the inner floral bracts. Rio de Janeiro (! Mez), Santa Catarina (! Mez).....4. N. princeps
7. Floral bracts and sepals green; pedicels to 15 mm long,

- shorter than the floral bracts. Espirito Santo, Rio de Janeiro.....5. N. farinosa
4. Leaf-blades sparsely and inconspicuously lepidote beneath, 25-35 mm wide; sepals rounded or acute.
8. Apex of leaf acute; inflorescence few-flowered. State (?) 6. N. olens
8. Apex of leaf semi-circular.
9. Leaf-blades with a prominent red apical spot; floral bracts only about equaling the ovary, obtuse. Guanabara.....7. N. indecora
9. Leaf-blades concolorous; floral bracts nearly equaling the sepals.
10. Leaves 40-60 cm long, the blades strongly serrulate; sepals 21-28 mm long, connate for about one fourth of their length, rounded and apiculate. Rio de Janeiro, Guanabara.....8. N. caroliniae
10. Leaves to 36 cm long, the blades subentire; sepals 19 mm long, connate for more than half their length, acute. Rio de Janeiro.....9. N. compacta
3. Inner leaves like the outer, not evenly bright red.
11. Leaf-sheaths forming a cylindric or ellipsoid tank more or less constricted at summit; blades 15-25 mm wide, ligulate or narrowly triangular; stolons long and slender.
12. Blades (at least in part) very narrowly triangular, acuminate, 15 mm wide; sepals but slightly asymmetric.
13. Leaves to 70 cm long; blades very soon completely glabrous; sepals 26 mm long. Bahia.....10. N. wilsoniana
13. Leaves 30 cm or slightly longer; blades densely lepidote beneath; sepals 14 mm long. Rio de Janeiro. 11. N. abendrothae
12. Blades all ligulate with broad apiculate apices.
14. Leaves concolorous; sepals very broadly obtuse, 12 mm long. São Paulo.....12. N. hoehniana
14. Leaves variegated; sepals acute, 15-17 mm long; probably one variable species, N. ampullacea.
15. Petals 42 mm long; floral bracts 7 mm long; leaf-blades cross-banded, subdensely brown-punctulate beneath. Espirito Santo.....13. N. punctatissima
15. Petals 20-24 mm long.
16. Petal-blades with broad blue margins and white centers; leaf-blades cross-banded. Espirito Santo, Rio de Janeiro.....14. N. ampullacea
16. Petal-blades wholly white. Espirito Santo.
17. Floral bracts 20 mm long; leaf-blades brown-banded. 15. N. tigrina
17. Floral bracts 11 mm long; leaf-blades brown-spotted. 16. N. rubrifolia
11. Leaf-sheaths forming a more open tank; blades 10-70 mm wide, always ligulate.
18. Sepals 13-18 mm long; flowers about 30 mm long or less; plants small; leaves 18-35 (-60) cm long; blades 10-30 (-45) mm wide.

19. Leaf-blades densely and persistently appressed-lepidote on both sides, 20-30 mm wide.
20. Leaf-blades broadly retuse by the reflexing of the apex, concolorous; sepals strongly asymmetric, acuminate. Minas Gerais.....17. N. leprosa
20. Leaf-blades straight with the apex erect, more or less white-banded beneath.
21. Sepals acuminate, strongly asymmetric, red-purple; leaf-sheaths pale-spotted. Espirito Santo, Rio de Janeiro. 18. N. tristis
21. Sepals broadly rounded, obtuse or apiculate; leaf-sheaths obscurely spotted or concolorous.
22. Sepals subsymmetrical, apiculate. Rio de Janeiro. 19. N. fluminensis
22. Sepals strongly asymmetrical, obtuse. Espirito Santo. 20. N. simulans
19. Leaf-blades soon glabrous above or very obscurely punctulate.
23. Sheaths conspicuously pale-spotted; sepals obtuse. Rio de Janeiro.....21. N. chlorosticta
23. Sheaths concolorous.
24. Leaf-blades bicolorous with contrasting sides, densely lepidote beneath; sepals obtuse or broadly acute.
25. Blades finely purple-spotted, plicate at apex. Rio de Janeiro, São Paulo.....22. N. maculata
25. Blades not spotted nor plicate at apex.
26. Leaf-blades shorter than the sheaths, strongly purple-tinged, rounded-retuse. São Paulo...23. N. doeringiana
26. Leaf-blades much longer than the sheaths, not purple-tinged nor retuse.
27. Blades 10-20 mm wide, inconspicuously serrulate, strongly sulcate beneath with scales wholly within the grooves, apiculus slenderly subulate. Minas Gerais. 24. N. cyanea
27. Blades 20-32 mm wide, strongly serrulate, the scales completely covering the lower surface. Minas Gerais, Espirito Santo, Rio de Janeiro.....25. N. sarmentosa
24. Leaf-blades concolorous, glabrous or very obscurely punctulate on both sides.
28. Sepals acuminate.
29. Pedicels 20 mm long; leaves 4-5 dm long, the blades to 40 mm wide. Rio de Janeiro.....26. N. macahensis
29. Pedicels 5-7 mm long; leaves 2 dm long, the blades 24 mm wide. Espirito Santo.....27. N. albiflora
28. Sepals broadly rounded.
30. Ovary clavate; pedicels obscure, not over 3 mm long. Paraná, Santa Catarina.....28. N. laevis
30. Ovary ellipsoid; pedicels distinct, to 10 mm long. Espirito Santo.....29. N. brevifolia
18. Sepals 19-37 mm long; flowers about 40 mm or longer; plants large; leaves 15-70 cm long; blades 20-100 mm wide.
31. Leaf-sheaths variegated with either light or dark spots.
32. Blades to 75 mm wide, the apex with a prominent red spot

and stout black terminal spine. State (?).

30. N. johannis
 32. Blades concolorous and with an inconspicuous terminal nerve.
 33. Sheaths marbled with large pale spots on a dark ground;
 blade to 80 mm wide. São Paulo.....31. N. marmorata
 33. Sheaths finely dark-spotted on light ground; blades 30 mm
 wide. Espirito Santo, Rio de Janeiro...32. N. magdalenae
 31. Leaf-sheaths concolorous or banded but not spotted,
 appressed-lepidote at least beneath.
 34. Inflorescence few- (10-25-) flowered.
 35. Leaf-blades with irregular purple bands on both sides, 1-2
 times as long as the sheaths. Espirito Santo.
 33. N. zonata
 35. Leaf-blades concolorous or regularly white-banded beneath,
 less than twice as long as the sheaths.
 36. Blades 50 mm wide, becoming retuse by the recession of the
 apex.
 37. Pedicels 30 mm long; leaf-blades sparingly dark-spotted,
 laxly serrate with black teeth 1.5 mm long. Espirito
 Santo.....34. N. melanodonta
 37. Pedicels 5 mm long; leaf-blades concolorous, green,
 subentire. Rio de Janeiro.....35. N. kuhlmannii
 36. Blades 20-35 mm wide, rounded and apiculate, remaining
 straight.
 38. Sepals to 34 mm long, acute; leaf-sheaths 1-3 times as
 long as the blades. Bahia, Minas Gerais, São Paulo.
 36. N. bahiana
 38. Sepals 20-24 mm long; leaf-sheaths shorter than to
 equaling the blades.
 39. Leaf-blades with straight sides and strongly antrorse-
 uncinuate spines; sepals acute. Minas Gerais.
 37. N. oligantha
 39. Leaf-blades with curved sides and nearly straight spines
 sepals acuminate. Espirito Santo....38. N. pauciflora
 34. Inflorescence many-flowered, broad.
 40. Leaves marked with a red spot at apex and strong transverse
 bands on the underside; floral bracts broad, acuminate,
 about equaling the subulate-acuminate sepals.
 41. Blades banded on both sides; sepals straight, green; petal
 blades white. São Paulo.....39. N. binotii
 41. Blades concolorous above; sepals uncinuate, red; petals
 blue. Rio de Janeiro.....40. N. spectabilis
 40. Leaves concolorous or purple-spotted at apex; floral bracts
 narrow, usually exceeded by the sepals.
 42. Leaves cinereous throughout, a dense covering of coarse
 scales concealing the color. Espirito Santo.
 41. N. seideliana
 42. Leaves with color not obscured by scales.
 43. Leaf-sheaths dark brown; sepals 33-34 mm long, slightly
 to one fourth exserted above the floral bracts.
 44. Blades 55 mm wide, truncate with a soft apiculus that
 rapidly disintegrates; sepals free. State (?).

42. N. leucophoea
 44. Blades 30 mm wide, acute with a persistent terminal
 subulus 5 mm long; sepals connate for 5 mm. State (?)
 43. N. uleana
 43. Leaf-sheaths green or purple.
 45. Leaf-spines more than 7 mm long; sepals 37 mm long; flo-
 ral bracts about equaling the center of the sepals;
 petals white. Espirito Santo, Guanabara.
 44. N. carcharodon
 45. Leaf-spines not more than 4 mm long.
 46. Floral bracts nearly or quite equaling the sepals, ob-
 tuse, cucullate; sepals acute, straight; leaf-spines
 red. Rio de Janeiro, Guanabara, São Paulo.
 45. N. cruenta
 46. Floral bracts much exceeded by the sepals; sepals
 subulate-acuminate.
 47. Leaf-blades subentire or minutely serrulate; pedicels
 ca 8 mm long. Rio de Janeiro (?)....46. N. coriacea
 47. Leaf-blades with strong black spines to 4 mm long;
 pedicels 10-18 mm long. Rio de Janeiro, Guanabara.
 47. N. concentrica
 1. Petals free; pedicels obscure, merging with the slender ovary.
 Amazon Basin.....Subgenus AMAZONICAE

Subgenus NEOREGELIA

1. N. FOSTERIANA L. B. Smith, Arquiv. Bot. Estado S. Paulo n.
 ser. 2: 120, pl. 50. 1950. Type: Foster 123. Pl. III, fig. 3:
 Flower and bract x 1 (after Hoehne).

2. N. PINELIANA (Lem.) L. B. Smith, Contr. Gray Herb. 114: 5.
 1936.

Forma PINELIANA. Nidularium pinelianum Lem. Ill. Hort. 7,
 Misc.: 71. 1860. Type: Pinel in Hort. Ghent. Caraguata coerulea
Pinel ex Lem. l. c. Nomen. Karatas morreniana Ant. Phyto-Icon.
 pl. 35. 1884. Type: Plate (no text). Nidularium morrenianum
Hort. Makoy ex Baker, Handb. Bromel. 9. 1889. Nomen. Nidularium
guyanense Brongn. ex Baker, l. c. Nomen. Nidularium pulverulen-
tum E. Morr. ex Baker, l. c. Nomen. Regelia morreniana (Ant.)
Lindm. Oefvers. Vet. Akad. Förhandl. 47: 543. 1890. Aregelia
morreniana (Ant.) Mez in DC. Mon. Phan. 9: 72. 1896. Billbergia
mooreana Hort. de Cock, Cat. 5. 1910. Nomen (fide W. Robyns).
Nidularium mooreanum Hort. Haage & Schmidt, Cat. 211. 1912.
Nomen (fide Mez). Neoregelia morreniana (Ant.) L. B. Smith,
Contr. Gray Herb. 104: 79. 1934. Aregelia pineliana Mez,
Pflanzenreich IV. 32: 40, fig. 12. 1934. Inflorescence normal.
 Pl. III, fig. 4: Floral bract x 1.

Forma PHYLLANTHIDEA (E. Morr. ex Baker) L. B. Smith, comb.
 nov. Karatas morreniana Ant. var. phyllanthidea E. Morr. ex
 Baker, Handb. Brom. 10. 1889. Type: Morren Icon. Aregelia
morreniana var. phyllanthidea (E. Morr. ex Baker) Mez in DC. Mon.
Phan. 9: 79. 1896. Inflorescence changed to a tuft of enlarged

colored sterile bracts.

3. N. MACROSEPALA L. B. Smith, Smithsonian Misc. Coll. 126: 28 153, fig. 61. 1955. Type: Foster 968. Pl. III, fig. 5: Sepal x 1.

4. N. PRINCEPS (Baker) L. B. Smith, Contr. Gray Herb. 114: 5. 1936.

Forma PRINCEPS. ? Karatas meyerendorffii Ant. Phyto-Icon. 94, pl. 30. 1884. In part, not as to basonym (fide Mez). ? Nidularium marichali Hort. Makoy ex Baker, Handb. Brom. 9. 1889. Nomen. Karatas princeps Baker, op. c. 10. Type: Morren Icon. Nidularium princeps E. Morr. ex Baker, l. c. Nomen. Nidularium spectabile hort. ex Baker, l. c. Nomen. Non Moore. Regelia princeps (Baker) Lindm. Oefvers. Vet. Akad. Förhandl. 47: 543. 1890. Erroneously ascribed to E. Morr. ? R. marechali Lindm. l. c. Nomen. Based on Nidularium marichali. Aregelia princeps (Baker) Mez in DC. Mon. Phan. 9: 75. 1896. Nidularium meyerendorffii var. pruinosa E. Morr. ex Mez, op. c. 70. Nomen. Based on Morr. Icon. Aregelia marechali Mez, Pflanzenreich IV. 32: 43. 1934. As to basonym, not as to material or description. Outer bracts of the inflorescence smaller than the inner leaves, bracteiform. Pl. III, fig. 6: Sepal x 1 (after Antoine).

Forma PHYLLANTHIDEA (Mez) L. B. Smith, comb. nov. Aregelia princeps var. phyllanthidea Mez in DC. Mon. Phan. 9: 76. 1896. Type: Description. Neoregelia princeps var. phyllanthidea (Mez) L. B. Smith, Smithsonian Misc. Coll. 126: 31. 1955. Outer bracts of the inflorescence enlarged and foliaceous but bright red. Described from cultivation, no surviving material known.

5. N. FARINOSA (Ule) L. B. Smith, Contr. Gray Herb. 124: 9. 1939. Nidularium farinosum Ule, Bericht. Deutsch. Bot. Gesellsch. 18: 319. 1900. Type: Ule 4961. Aregelia farinosa (Ule) Mez, Pflanzenreich IV. 32: 42. 1934.

6. N. OLENS (Hook. f.) L. B. Smith, Contr. Gray Herb. 124: 10. 1939. Billbergia olens Hook. f. Bot. Mag. 91: pl. 5502. 1865. Type: Hort. Kew. Karatas olens (Hook. f.) Nicholson, Diet. Gard. 2: 216. 1885. Aregelia olens (Hook. f.) Mez, Pflanzenreich IV. 32: 42. 1934.

7. N. INDECORA (Mez) L. B. Smith, Contr. Gray Herb. 124: 9. 1939. Aregelia indecora Mez, Fedde Rep. Spec. Nov. 16: 3. 1919. Type: Ule 4134.

8. N. CAROLINAE (Beer) L. B. Smith, Contr. Gray Herb. 124: 9. 1939.

Forma CAROLINAE. Bromelia carolinae Beer, Brom. 29. 1857. Type: Hort. Berlin. Billbergia carolinae Hort. Van Houtte ex Beer, l. c. Nomen. Guzmania picta hort. ex Beer, l. c. Nomen. Billbergia meyerendorffii Regel, Bot. Zeitung 15: 713. 1857. Nidularium meyerendorffii (Regel) Regel, Gartenflora 8: 266, fig. 5-8. 1859. Karatas carolinae (Beer) Ant. Phyto-Icon. 52, pl. 31. 1884. K. meyerendorffii (Regel) Ant. op. c. 54. As to basonym only. Nidularium carolinae Lem. ex Baker, Handb. Brom. 9. 1889. Nomen. Bromelia rhodocincta Brongn. ex Baker, op. c. 11 (fide Mez). Regelia meyerendorffii (Regel) Lindm. Oefvers. Kgl. Vet. Akad. Förhandl. 47: 543. 1890 (combination not made by Lem. in 1860 as

cited by Mez). Aregelia carolinae (Beer) Mez in DC. Mon. Phan. 9: 74. 1896. A. marechalii Mez, Pflanzenreich IV. 32: 43. 1934. Leaf-blades not striped. Pl. III, fig. 7: Sepal x 1.

Forma TRICOLOR (M. B. Foster) M. B. Foster, comb. nov. N. carolinae var. tricolor M. B. Foster, Brom. Soc. Bull. 3: 29. 1953. Type: Foster 2831. Leaf-blades longitudinally striped white, rose and green.

9. N. COMPACTA (Mez) L. B. Smith, Contr. Gray Herb. 124: 9. 1939. Nidularium compactum Mez in Mart. Fl. Bras. 3, pt. 3: 235. 1891. Type: Schenck 2090. Nidularium purpureum sensu Wittm. Bot. Jahrb. 13, Beibl. 29: 10. 1891. In part, as to Schenck. Non Beer. Aregelia compacta (Mez) Mez in DC. Mon. Phan. 9: 73. 1896.

10. N. WILSONIANA M. B. Foster, Brom. Soc. Bull. 9: 83, figs. 1959. Type: Wilson 20.

11. N. ABENDROTHAE L. B. Smith, Brom. Soc. Bull. 10: 24, figs. 1960. Type: Abendroth 119. Pl. III, fig. 8: Sepal x 1.

12. N. HOEHNEANA L. B. Smith, Smithsonian Misc. Coll. 126: 28, 150, fig. 56. 1955. Type: Gehrt s. n. Pl. III, fig. 9: Sepal x 1.

13. N. PUNCTATISSIMA (Ruschi) Ruschi, Bol. Mus. Biol., Bot. no. 15: 2. 1954. Nidularium punctatissimum Ruschi, Bull. Mus. Nation. Hist. Nat. II. 26: 547, fig. 1954. Type: Ruschi s. n.

14. N. AMPULLACEA (E. Morr.) L. B. Smith, Contr. Gray Herb. 104: 78. 1934. Nidularium ampullaceum E. Morr. Belg. Hort. 30: 242. 1880; 35: 174, pl. 14. 1885. Type: Binot in Hort. Liège. Karatas ampullacea (E. Morr.) Baker, Handb. Bromel. 7. 1889. Regelia ampullacea (E. Morr.) Lindm. Oefvers. Vet. Akad. Förhandl. 47: 543. 1890. Aregelia ampullacea (E. Morr.) Mez in DC. Mon. Phan. 9: 64. 1896.

15. N. TIGRINA (Ruschi) Ruschi, Bol. Mus. Biol. Bot. no. 15: 2. 1954. Nidularium tigrinum Ruschi, Bull. Mus. Nation. Hist. Nat. II. 26: 544, fig. 1954. Type: Ruschi s. n.

16. N. RUBRIFOLIA Ruschi, Bol. Mus. Biol. Prof. Mello Leitão 15: 1, fig. 1954. Type: Ruschi s. n.

17. N. LEPROSA L. B. Smith, Smithsonian Misc. Coll. 126: 29, 150, fig. 57. 1955. Type: Foster 656. Pl. III, fig. 10: Sepal x 1.

18. N. TRISTIS (Beer) L. B. Smith, Proc. Amer. Acad. 70: 153. 1935. Bromelia tristis Beer, Brom. 30. 1857. Type: Hort. Berlin Billbergia purpurea Van Houtte ex Beer, l. c. Nomen. Nidularium triste (Beer) Regel, Gartenflora 15: 356. 1866. Nidularium cyaneum Linden & André, Ill. Hort. 20: 184. 1873. Type: Hort. Linden Non Hort. Berlin. Karatas tristis (Beer) Baker, Handb. Brom. 5. 1889. Nidularium marmoratum hort. ex Baker, l. c. Nomen. Non E. Morr. Karatas cyanea (Linden & André) Baker, l. c. Nidularium elegans E. Morr. ex Baker, l. c. Nomen, based on Morr. Icon. Regelia tristis (Beer) Lindm. Oefvers. Vet. Akad. Förhandl. 47: 542. 1890. Aregelia tristis (Beer) Mez in DC. Mon. Phan. 9: 68. 1896. A. elegans Mez, op. c. 69 (not a combination on Nidularium elegans E. Morr. ex Baker, because that was a nomen). Type: Morren Icon.

19. *N. FLUMINENSIS* L. B. Smith, Smithsonian Misc. Coll. 196: 27, 150, fig. 58. 1955. Type: Foster 982. Pl. III, fig. 11: Sepal x 1.

20. *N. SIMULANS* L. B. Smith, sp. nov. A *N. fluminensis* L. B. Smith, cui affinis, sepalis valde asymmetricis obtusisque differt.

PLANT known only from fragments. LEAVES uniform (! A. Seidel) to 14 cm long, covered on both sides with appressed cinereous brown-centered scales; sheaths broadly elliptic, 7 cm long, tinged with purple; blades ligulate, narrowly rounded and apiculate, 2 cm wide, regularly white-banded beneath, laxly serrulate with antrorse brown spines 1 mm long. SCAPE 4 cm long; scape-bracts imbricate, broadly ovate, acuminate, membranaceous, white, sparsely and finely brown-lepidote, the upper involucre about the inflorescence, elliptic, rounded, nearly equaling the sepals, entire. INFLORESCENCE simple, few-flowered, 3 cm in diameter; floral bracts like the upper scape-bracts but narrower, equaling $3/4$ of the sepals; pedicels distinct, slender, 10 mm long. SEPALS very strongly asymmetric with a broad wing, obtuse, 12 mm long, connate for 2 mm. OVARY ellipsoid, 9 mm long. Pl. III, fig. 12: Sepal x 1.

BRAZIL: Espirito Santo: Morro Pinna Fogo, between Castelo and Fruteira, 29 November 1962, A. Seidel 66-3 (HBR, type).

21. *N. CHLOROSTICTA* (Baker) L. B. Smith, Phytologia 10: 486. 1954. Karatas chlorosticta Baker, Handb. Brom. 7: 1899. Nidularium chlorosticta E. Morr. ex Baker, l. c. Nomen. Billbergia chlorosticta hort. ex Baker, l. c. Nomen. Regelia chlorosticta (Baker) Lindm. Oefvers. Vet. Akad. Förhandl. 47: 543. 1896. Arengia chlorosticta (Baker) Mez in DC. Mon. Phan. 9: 65. 1896. Neoregelia sarmentosa (Regel) L. B. Smith var. chlorosticta (Baker) L. B. Smith, Contr. Gray Herb. 104: 79. 1934. Neoregelia marmorata L. B. Smith, op. c. 124: 10. 1939; Smithsonian Misc. Coll. 126: 157. 1955. In part, as to material cited. Neoregelia chlorosticta Fritz Encke, Pareys Blumengärtnerei 1: 206. 1958. Nomen. Erroneously attributed to L. B. Smith. Pl. III, fig. 13: Sepal x 1 (after Morren Icon).

22. *N. MACULATA* L. B. Smith, sp. nov. A *N. sarmentosa* (Regel) L. B. Smith, cui verisimiliter affinis, foliorum laminis minute purpureo-maculatis apice plicatis differt.

PLANT stoloniferous. LEAVES about 8 in a narrowly obconical rosette, to 26 cm long; sheaths broadly elliptic, 8 cm long, castaneous-lepidote; blades ligulate, rounded and apiculate, to 23 mm wide, covered beneath with appressed cinereous brown-centered scales, glabrous above and finely purple-spotted, subentire. SCAPE 45 mm long; scape-bracts imbricate, the upper ones involucre about the inflorescence, elliptic, rounded, exceeding the center of the sepal, membranaceous, purple apically, subdensely brown-lepidote, entire. INFLORESCENCE simple, few-flowered, ca 2 cm in diameter; floral bracts like the upper scape-bracts but narrow; pedicels slender, distinct, to 4 mm long. SEPALS asymmetric, broadly acute or obtuse, 16 mm long, connate for 3 mm. PETALS white (DeLeon). OVARY narrowly ellipsoid, 7 mm long. Pl. III, fig. 14: Sepal x 1.

BRAZIL: Cultivated, 19 June 1962, N. J. DeLeon P-109 (US, type). Fragmentary, but probably the same is: Rio de Janeiro: Litoral, 6 January 1965, L. Seidel 1 (HBR).

23. N. DOERINGIANA L. B. Smith, Phytologia 7: 176, pl. 2, fig. 10-12. 1960. Type: Doering 7. Pl. III, fig. 15: Apex of leaf x 1; fig. 16: Sepal x 1.

24. N. CYANEA (Beer) L. B. Smith, Contr. Gray Herb. 124: 9. 1939. Hoplophytum cyaneum Beer, Brom. 131. 1857. Type: Hort. Berlin. Nidularium cyaneum Hort. Berlin ex Beer, l. c. Nomen. Non Linden & André. Bromelia denticulata K. Koch, Wochenschr. 2: 151. 1859. Type: Hort. Berlin. Billbergia angustifolia K. Koch, Wochenschr. 9: 181. 1866. Bromelia pauciflora K. Koch, l. c. Type: Hort. Berlin. Nidularium denticulatum (K. Koch) Regel, Gartenflora 19: 268. 1870. Karatas denticulata (Regel) Baker, Handb. Brom. 4. 1889. Bromelia angustifolia Baker, Handb. Brom. 4. 1889. Nomen. Wrongly attributed to K. Koch. Nidularium agavifolium hort. ex Baker, l. c. Nomen. Regelia denticulata (K. Koch) Lindm. Oefvers. Vet. Akad. Förhandl. 47: 542. 1890. Aregelia cyanea (Beer) Mez in DC. Mon. Phan. 9: 67. 1896. Pl. III, fig. 17: Apex of leaf x 1.

25. N. SARMENTOSA (Regel) L. B. Smith, Contr. Gray Herb. 104: 79. 1934. Nidularium sarmentosum Regel, Gartenflora 19: 268. 1870. Type: Hort. Petrograd ex Hort. Berlin. Aechmea immersa hort. ex Regel, l. c. Nomen. Nidularium denticulatum var. simplex Wawra, Oesterr. Bot. Zeitschr. 30: 112. 1880; Bull. Fédér. Soc. Hort. Belg. 35. 1880. Karatas sarmentosa (Regel) Baker, Handb. Brom. 5. 1889. Regelia sarmentosa (Regel) Lindm. Oefvers. Vet. Akad. Förhandl. 47: 542. 1890. Aregelia sarmentosa (Regel) Mez in DC. Mon. Phan. 9: 66. 1896. Pl. III, fig. 18: Leaf-margin x 1.

26. N. MACAHENSIS (Ule) L. B. Smith, Contr. Gray Herb. 124: 9. 1939. Nidularium macahense Ule, Bericht. Deutsch. Bot. Gesellsch 18: 318. 1900. Type: Ule 4960. Aregelia macahensis (Ule) Mez, Pflanzenreich IV. 32: 45. 1934.

27. N. ALBIFLORA L. B. Smith, Arquiv. Bot. Estado S. Paulo n. ser. 1: 109, pl. 113. 1943. Type: Foster 309. Pl. III, fig. 19: Sepal x 1 (after Hoehne).

28. N. LAEVIS (Mez) L. B. Smith, Contr. Gray Herb. 104: 78. 1934. Aregelia laevis Mez, Ind. Sem. Hort. Regimont. 1912: 8. 1912; Fedde Rep. Spec. Nov. 12: 411. 1913. Type: E. Müller in Hort. Regimont. Karatas candida Hort. Paris ex Mez, l. c. Nomen. Pl. III, fig. 20: Sepal x 1.

29. N. BREVIFOLIA L. B. Smith & Reitz, sp. nov. A N. laevis (Mez) L. B. Smith, cui verisimiliter affinis, pedicellis manifestis longioribus, ovariis crassis differt.

PLANT stoloniferous. LEAVES more than 30 in abradly obconic rosette, to 23 cm long, sparsely and obscurely lepidote beneath; sheaths broadly elliptic, 9 cm long; blades ligulate, broadly rounded and apiculate, to 28 mm wide, sparsely and obscurely serrulate. SCAPE 3 cm long; upper scape-bracts involucrate about the inflorescence, slightly exceeding the ovaries, broadly elliptic, membranaceous, pale. INFLORESCENCE simple, few-flowered, ca

2 cm in diameter; floral bracts like the upper scape-bracts but narrower, entire; pedicels distinct, to 16 mm long. SEPALS slightly asymmetric, obtuse, 12 mm long, connate for 4 mm, apically red-purple (! A. Seidel). PETALS 23 mm long, connate for 2 mm, the upper 2/3 blue (! A. Seidel). OVARY ellipsoid, 6 mm long. Pl. III, fig. 21: Sepal x 1.

30. N. JOHANNIS (Carr.) L. B. Smith, Smithsonian Misc. Coll. 126: 38. 1955. Nidularium johannis Carr. Rev. Hort. 56: 432. 1884. Type: Hort. Sullier. Karatas johannis (Carr.) Baker, Handb. Brom. 11. 1889. Regelia johannis (Carr.) Lindm. Oefvers. Vet. Akad. Förhandl. 47: 543. 1890. Aregelia johannis (Carr.) Mez in DC. Mon. Phan. 9: 84. 1896.

31. N. MARMORATA (Baker) L. B. Smith, Contr. Gray Herb. 124: 10. 1939. Nidularium laurentii var. elatus Regel, Gartenflora 34: 243. 1835. Type: Glaziou in Hort. Petrograd. Karatas marmorata Baker, Handb. Brom. 11. 1889. Type: Morren Icon. Nidularium marmoratum E. Morr. ex Baker, l. c. Nomen. Bromelia marmorata Brongn. ex Baker, l. c. Nomen. Aregelia marmorata (Baker) Mez in DC. Mon. Phan. 9: 76. 1896. Pl. III, fig. 22: Sepal x 1 (after Morren Icon).

32. N. MAGDALENAE L. B. Smith & Reitz, sp. nov. A N. marmorata (Baker) L. B. Smith, cui affinis, foliorum vaginis minute atro-maculatis, laminis multo angustioribus differt.

PLANT known only from fragments. LEAVES 4 dm long; sheaths broadly elliptic, 14 cm long, densely and finely spotted with red purple on a pale green ground, subdensely appressed-lepidote; blades ligulate, 3 cm wide, sparsely and obscurely lepidote on both sides, laxly serrulate with antrorsely curved brown spines 1 mm long. SCAPE 4 cm long; upper scape-bracts involucrate about the inflorescence, broadly ovate, equaling the middle of the sepal or higher. INFLORESCENCE variable; floral bracts lanceolate, slightly exceeded by the sepals, entire; pedicels distinct, slender. SEPALS lanceolate, acuminate, short-connate.

Var. MAGDALENAE. Inflorescentia multiflora, pedicellis sepalisque majoribus.

INFLORESCENCE many-flowered; pedicels to 25 mm long. SEPALS 34 mm long, connate for 4 mm. Pl. III, fig. 23: Sepal x 1.

BRAZIL: Rio de Janeiro: Madalena, 13 December 1964, Reitz 6314 (HBR, type).

Var. TERESAE L. B. Smith & Reitz, var. nov. A var. magdalenae inflorescentia pauciflora, pedicellis sepalisque minoribus differt, sed foliis omnino similibus.

INFLORESCENCE few-flowered; pedicels to 15 mm long. SEPALS 28 mm long.

BRAZIL: Espirito Santo: Santa Teresa, 2 November 1962, A. Seidel 501 (HBR, type).

33. N. ZONATA L. B. Smith, Arquiv. Bot. Estado S. Paulo n. ser 2: 120, pl. 51. 1950. Type: Foster 197. Pl. III, fig. 24: Sepal x 1 (after Hoehne).

34. N. MELANODONTA L. B. Smith, Smithsonian Misc. Coll. 126: 30, 155, fig. 66. 1955. Type: Foster 897. Pl. III, fig. 25: Apex of leaf x 1/4; fig. 26: Sepal x 1.

35. N. KUHLMANNII L. B. Smith, Smithsonian Misc. Coll. 126: 28, 152, fig. 60. 1955. Type: M. Kuhlmann 2652. Pl. III, fig. 27: Sepal x 1.

36. N. BAHIANA (Ule) L. B. Smith, Proc. Amer. Acad. 70: 152. 1935.

Forma BAHIANA. Nidularium bahianum Ule, Bot. Jahrb. 42: 195. 1908. Type: Ule 7105. Aregelia bahiana (Ule) Mez, Pflanzenreich IV. 32: 42. 1934. All or at least the inner leaves purple on the upper surface.

Forma VIRIDIS (L. B. Smith) L. B. Smith, comb. nov. N. bahiana var. viridis L. B. Smith, Smithsonian Misc. Coll. 126: 27, 148. 1955. Type: Foster 573.

37. N. OLIGANTHA L. B. Smith, Smithsonian Misc. Coll. 126: 30, 153, fig. 62. 1955. Type: Foster 742. Pl. III, fig. 28: Sepal x 1.

38. N. PAUCIFLORA L. B. Smith, Smithsonian Misc. Coll. 126: 31, 155, fig. 65. 1955. Type: Foster 265. Pl. III, fig. 29: Sepal x 1.

39. N. BINOTII (Ant.) L. B. Smith, Contr. Gray Herb. 114: 5. 1936. Karatas binotii Ant. Phyto-Icon. pl. 34. 1884. Nidularium binotii E. Morr. ex Baker, Handb. Brom. 12. 1889. Nomen. Regelia binotii (Ant.) Lindm. Oefvers. Vet. Akad. Förhandl. 47: 543. 1890. Aregelia binotii (Ant.) Mez in DC. Mon. Phan. 9: 82. 1896. Pl. III, fig. 30: Flower and bract x 1 (after Antoine).

40. N. SPECTABILIS (Moore) L. B. Smith, Contr. Gray Herb. 104: 79. 1934. Nidularium spectabile Moore, Gard. Chron. 8. 1873. Type: Hort. Bull. Karatas spectabilis Ant. Phyto-Icon. pl. 33. 1884. Type: Plate, probably intended as a new combination but no text. Nidularium eximium hort. ex Baker, Handb. Brom. 11. 1889. Nomen. Regelia spectabilis (Moore) Lindm. Oefvers. Vet. Akad. Förhandl. 47: 543. 1890. Aregelia spectabilis (Moore) Mez in DC. Mon. Phan. 9: 70. 1896. Pl. III, fig. 31: Flower and bract x 1. (after Antoine).

41. N. SEIDELIANA L. B. Smith & Reitz, Phytologia 10: 486, pl. 2, fig. 10, 11. 1964. Type: A. Seidel s. n. Pl. III, fig. 32: Sepal x 1.

42. N. LEUCOPHOEA (Baker) L. B. Smith, Contr. Gray Herb. 124: 9. 1939. Karatas leucophoea Baker, Handb. Brom. 7. 1889. Type: Morren Icon. Nidularium leucophoeum E. Morr. ex Baker, l. c. Nomen. Andrea spectabilis hort. ex Baker, l. c. Nomen. Aregelia leucophoea (Baker) Mez in DC. Mon. Phan. 9: 77. 1896.

43. N. ULEANA L. B. Smith, Smithsonian Misc. Coll. 126: 31, 152, fig. 59. 1955. Pl. III, fig. 33: Sepal x 1.

44. N. CARCHARODON (Baker) L. B. Smith, Proc. Amer. Acad. 70: 152. 1935. Karatas carcharodon Baker, Handb. Brom. 12. 1889. Type: Morren Icon. Nidularium carcharodon E. Morr. ex Baker, l. c. Nomen. Karatas macracantha Baker, l. c. Nomen. Aregelia carcharodon (Baker) Mez in DC. Mon. Phan. 9: 78. 1896.

45. N. CRUENTA (R. Graham) L. B. Smith, Contr. Gray Herb. 124: 9. 1939. Bromelia cruenta R. Graham, Edinburg Phil. Journ. 174. 1828. Type: Harris in Hort. Edinburg. Billbergia cruenta (R. Graham) Hook. in Bot. Mag. 54: pl. 2892. 1829. Nidularium

cruentum (R. Graham) Regel, Gartenflora 3: 367. 1887. N. laurentii var. immaculatum Regel, Gartenflora 34: 243. 1889. Type: Hort. Petrop. Karatas cruenta (R. Graham) Nicholson, Dict. Gard. 2: 216. 1865. Regelia cruenta (R. Graham) Lindm. Oefvers. Vet. Akad. Förhandl. 47: 543. 1890 (combination not made by Less. in 1860 as cited by Mez). Nidularium longebracteatum Mez in Mart. Fl. Bras. 3, pt. 3: 239. 1891. Type: Rudio 103. Aregelia cruenta (R. Graham) Mez in DC. Mon. Phan. 9: 71. 1896. A. longebracteata (Mez) Mez, op. c. 79. A. rubrospinoso Mez, Fedde Rep. Spec. Nov. 12: 418. 1913. Type: Hort. Regimont. Neoregelia longebracteata (Mez) L. B. Smith, Contr. Gray Herb. 124: 0. 1930. N. rubrospinoso (Mez) L. B. Smith, op. c. 10. Pl. III, fig. 34: Flower without pedicel x 1 (after Botanical Magazine).

46. N. CORIACEA (Ant.) L. B. Smith, Smithsonian Misc. Coll. 126: 27, 152. 1955. Karatas coriacea Ant. Phyto-Icon. 51, pl. 30, fig. 1. 1884. Type: Description and plate. Nidularium coriaceum Hort. Linden ex Ant. l. c. Nomen. Regelia coriacea (Ant.) Lindm. Oefvers. Vet. Akad. Förhandl. 47: 543. 1890.

47. N. CONCENTRICA (Vell.) L. B. Smith, Contr. Gray Herb. 104: 78. 1934. Tillandsia concentrica Vell. Fl. Flum. 134. 1825; Icon. 3: pl. 133. 1835. Type: Description and plate. Bromelia concentrica (Vell.) Beer, Brom. 29. 1857. Nidularium laurentii Regel, Ind. Sem. Hort. Petrop. 1866: 80. 1867. Type: Libon in Hort. Laurent. Billbergia aurantiaca Hort. Laurent ex Regel, l. c. Nomen. Nidularium acanthocrater E. Morr. Belg. Hort. 34: 140 pl. 9. 1884. Type: Hort. Makoy. Karatas laurentii (Regel) Ant. Phyto-Icon. 48, pl. 23. 1884. K. acanthocrater (E. Morr.) Ant. op. c. 49, pl. 29, 30, fig. 2. Nidularium laurentii Regel var. typica Regel, Gartenflora 34: 243. 1885. Regelia acanthocrater (E. Morr.) Lindm. Oefvers. Vet. Akad. Förhandl. 47: 543. 1890. R. laurentii (Regel) Lindm. l. c. Nidularium concentricum (Vell.) Mez in Mart. Fl. Bras. 3, pt. 3: 239. 1891. Aregelia laurentii (Regel) Mez in DC. Mon. Phan. 9: 80. 1896. A. concentrica (Vell.) Mez, op. c. 81. Pl. III, fig. 35: Flower and bract x 1 (after Antoine).

Subgenus AMAZONICAE

NEOREGELIA subgenus AMAZONICAE, subgen. nov. A subgenere Neoregelia petalis liberis, pedicellis ex ovario vix distinctis differt. Type: N. eleutheropetala (Ule) L. B. Smith (Nidularium eleutheropetalum Ule).

For revision of species cf. Phytologia 9: 242. 1963.

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APPENDIX
(Doubtful taxa)

Neoregelia makoyana (Regel) L. B. Smith, Contr. Gray Herb. 124: 10. 1939. Nidularium makoyanum Regel, Gartenflora 36: 656. 1937. Type: Hort. Petrograd. Karatus makoyana (Regel) Baker, Handb. Brom. 11. 1899. Nidularium sanguinarium hort. ex Baker, op. c. 12 (fide Mez). Regelia makoyana (Regel) Lindm. Oefvers. Vet. Akad. Förhandl. 47: 543. 1890. Aregelia makoyana (Regel) Mez, Pflanzenreich IV. 32: 50. 1934. In part, as to basonym.

Evidently the plant described under Aregelia makoyana by Mez from material from Paris is not the same as Regel's Nidularium makoyanum. Regel emphasizes the red apical spot on the leaf and describes the petal-apex as pale violet. Mez makes no mention of any red apical spot on the leaf and keys the species out on its pale red flowers although in the description he calls them pale violet. I suspect that Regel's plant is conspecific with Neoregelia binotii and that Mez's may be an undescribed species.

Neoregelia species? Nidularium caeruleum Lem. Ill. Hort. 7: sub pl. 245. 1860. Tillandsia caerulea hort. ex Lem. l. c. Nomen. Caraguata caerulea hort. ex Lem. l. c. Nomen. Billbergia caerulea hort. ex Lem. l. c. Nomen. Regelia caerulea Lem. ex Jackson, Ind. Kew. 4: 694. 1895. Nomen. Not Lem. above, as he indicated only a provisional status for Regelia.

Although Lemaire's Regelia was only a provisional name, his recognition of generic characters makes it likely that Nidularium caeruleum is some species of Neoregelia. Further than that it is not possible to go until authentic material is discovered.

OCHAGAVIA

OCHAGAVIA CARNEA (Beer) Smith & Looser, Revista Universitaria Chile 13, no. 8: 1078, 1080. 1934. Bromelia lindleyana Lem. Jard. Fleur. 3: sub pl. 223. 1853. Nomen provis. B. longifolia sensu Lindl. in Paxton, Fl. Gard. 2: pl. 65. 1851. Based on plate. Non Rudge 1805. Bromelia carnea Beer, Brom. 31. 1857. Nomen nov. for B. longifolia sensu Lindl. Ochagavia lindleyana Mez, Pflanzenreich IV. 32: 204. 1935 (Not a new combination as intended, because based on a nomen). Placseptalia rebecca Espinosa, Bol. Mus. Nac. Hist. Nat. Chile 23: 8, pl. 1-6. 1947. Type: Espinosa s. n.

ORTHOPHYTIUM

ORTHOPHYTIUM SAXICOLA (Ule) L. B. Smith var. ALOIFOLIA L. B. Smith, var. nov. Cryptanthopsis aloifolia O. Schwartz, nomen. A var. saxicola scapi vaginis supremis elongatis inflorescentiam multo superantibus differt.

BRAZIL: Cultivated, 18 March 1939, Bot. Gart. Hamburg, 1957, Oeser (HBG, type); cultivated, 1 March 1966, Bot. Gart. Berlin (B).

Although I generally avoid the publication of nomina nuda,

there are times when it seems desirable as a clarification of names current in horticulture.

PITCAIRNIA

(Supplement to Revision in Phytologia 10: 1. 1964,
species alphabetical)

118a. *P. ABUNDANS* L. B. Smith, Phytologia 10: 483, pl. 2, fig. 1, 2. 1964.

As already noted, this belongs with *P. aequatorialis* L. B. Smith, differing in its tuberculate rhachis, spreading flowers and costate ovary.

74a. *P. ELLENBERGII* L. B. Smith, sp. nov. *P. cuzcoensis* L. B. Smith in systema mea proxima sed ramis longioribus crassioribusque, pedicellis quam bracteis florigeris multo brevioribus differt.

PLANT flowering over 1 m high. LEAVES polymorphic, the outermost reduced to small suborbicular castaneous sheaths with short linear blades, the median with elongate sheaths and long linear spinose-serrate blades, the innermost subpetiolate, ca 1 m long, the blade linear-lanceolate, acuminate, 3 cm wide, very sparsely and obscurely serrate, covered beneath with a membrane of white scales, glabrous above, bearing a broad median whitish channel. SCAPE erect, 7 mm thick, white-flocculose; scape-bracts narrowly triangular, entire, the lower long-caudate, the upper merely acuminate, shorter than the internodes. INFLORESCENCE laxly bipinnate, 4 dm long, finely white-flocculose except the petals; axes stout; primary bracts like the upper scape-bracts, much exceeding the very short sterile bases of the branches but several times shorter than the branches themselves; floral bracts broadly elliptic, apiculate, to 15 mm long, entire, thin; pedicels spreading, slender, not over 6 mm long. SEPALS linear-lanceolate, acute, 22 mm long, ecarinate. PETALS 5 cm long, naked, red, exceeding the stamens. OVARY almost wholly superior; ovules caudate. Pl.III, fig. 36: Flower and bract x 1; fig. 37: Sepal x 1.

PERU: Cuzco: Moist Bromeliad mass at edge of rock wall, (association 86), Mandor, below Machupicchu, alt. 2000 m, 13 April 1957, H. Ellenberg 993 (U, type; phot. US).

256. *P. FLAMMEA* Lindl. var. *MACROPODA* L. B. Smith & Reitz, var. nov. A var. *floccosa* L. B. Smith, cujus inflorescentiae squamas simulans, pedicellis maximis bracteas florigeras parvas valde superantibus differt.

LEAVES 8 mm wide, bearing linear reddish scales beneath when young. INFLORESCENCE lax, 18 cm long, floccose; floral bracts linear-triangular, to 18 mm long; pedicels ascending, slender, to 35 mm long. SEPALS linear-lanceolate, ecarinate, acute, 22 mm long.

BRAZIL: Minas Gerais: Mun. Tombos: Locally rather frequent on ledges, Alto da Usina, ca 20° 54' S, 42° 02' W, 8 April 1950, M. Magalhães s. n. (Hb. Bradeanum, type; phot. US).

209a. *P. FLAVESCENTIA* Matuda, An. Inst. Biol. Univ. Nac. Aut. Mexico 36: 110, fig. 5. 1965.

MEXICO: Guerrero: Rocky slope, on crystalline rocks, in yellow deciduous woods, in partial shade of Bursera, Rincón de la Vieja, alt. 300 m, 8 September 1961, H. Kruse 801 (MEXU, type: HO. Kruse isotype; no material yet examined).

In my key this comes to subkey VI, lead 25 (1) and immediately differs from P. leprosa L. B. Smith, P. flammula Lindl. and P. andreae Linden by its very broad leaf-blades (50-65 mm). Except for the lack of a distinct petiole it looks more like P. chinensis Miranda.

30a. P. IRWINIANA L. B. Smith, *Phytologia* 13: 153, pl. 7, fig. 20-22. 1966.

As indicated, this keys to subkey III, lead 12, and is there distinguished by its alate sepals.

210a. P. LANOSISEPALA Matuda, *An. Inst. Biol. Univ. Nac. Aut. Mexico* 36: 111, fig. 6. 1965.

MEXICO: Guerrero: On large rocks, in shade of Quercus macrophylla woods, Rincón Viejo, alt. 300 m, 12 August 1963, H. Kruse 809 (MEXU, type; no material yet examined).

This is very closely related to P. molesta L. B. Smith, differing only in sepals maximally 30 mm long instead of 35 mm and in the white rather than ferruginous indument of the inflorescence.

60, 169. P. LANUGINOSA R. & P. *Fl. Peruv.* 3: 35, pl. 258. 1802 Type: Ruiz & Pavon. P. subpetiolata Baker, *Journ. Bot.* 12: 267. 1881. Type: Spruce s. n.

Examination of the type of Pitcairnia lanuginosa R. & P. in the Instituto "Antonio José Cavanilles" in Madrid has shown that there is no specific difference between it and the later P. subpetiolata Baker, which has been collected widely in northern South America. In my key, before seeing the type of P. lanuginosa, I had separated them on the amount of serration of the leaves (page 22, lead 23), but the species varies enough to cover both I now realize. The flowers, on the other hand, are unique and quite constant.

31. P. LIMAE L. B. Smith, *Phytologia* 7: 254, pl. 1, fig. 9, 10. 1960; emend.:

LEAVES many, all alike; sheaths broadly ovate, 3 dm long, dark castaneous; blades persistent, linear, long-attenuate, scarcely contracted at base, 13 mm wide, densely cinereous-lepidote beneath, soon glabrous above, laxly spinose-serrate at base, entire elsewhere.

BRAZIL: Ceará: Topotype, Ducke s. n. (MG 1661).

In the absence of leaves, I mistakenly entered P. limae with the deciduous leaves and with the persistent entire ones, but failed to cover what proves to be the real case, namely persistent partially serrate ones. Consequently the positions under subkey III, lead 37 (1), and subkey VI, lead 15 (1), should be deleted, and P. limae should be entered in subkey V, after lead 43 (1), differing from P. latifolia Ait. in its broad serrulate lower floral bracts.

241, 242. P. SPICATA (Lam.) Mez in DC. *Mon. Phan.* 9: 392. 1896, as to basonym, not as to description; L. B. Smith,

Phytologia 10: 44. 1964, and earlier publications.

Forma a. SPICATA. Bromelia foliis radicalibus brevibus & aculeatis, caulinis longissimis & integerrimis, inermibus Plum. Pl. Amer. ed. Burm. 52, pl. 63. 1755-60. Bromelia spicata Lam. Encycl. 1: 146. 1789. Type: Plumier s. n. Pitcairnia albucifolia Schrad. Blumenbl. 24. 1827. Type: Description, no specimen cited Bracteis florigeris lineari-lanceolatis.

Examination of Plumier material verifies the indication of his plate that Pitcairnia spicata is the form with narrow floral bracts and in no wise different from P. albucifolia Schrad. that Mez separated on this character. This leaves the broad-bracted form, called P. spicata by Mez, without a name, and the earliest specific name would have to be P. sulphurea Andrews, a rather unfortunate outcome because of the color implication. However, the distinctions given by Mez prove very fluid and without geographical significance, so that they are not even of varietal value. Furthermore, the color variation from the usual red petal to a yellow one can occur within a clone. Accordingly, I am making a fresh start by describing new forms and assigning the older names of other categories as synonyms as is possible under the International Code.

Forma b. LATIOR L. B. Smith, forma nov. A forma spicata bracteis florigeris latoribus, lanceolatis vel ovatis differt. Type: R. A. Howard 11945.

Pitcairnia latifolia Redouté, Lil. pl. 74. 1804, non Ait. 1789 P. bracteata A. Ait. Hort. Kew. ed. 2, 2: 202. 1811. P. spicata Mez in DC. Mon. Phan. 9: 392. 1896, as to description, not as to basonym; L. B. Smith, Phytologia 10: 44. 1964.

ST. KITTS: In the water and on the margins of Dos d'Ans (Dons) Pond, 19-24 June 1950, R. A. Howard 11945 (US, type).

Forma c. PALLIDA L. B. Smith, forma nov. A forma spicata bracteis florigeris ovatis vel lanceolatis, a forma laticor petalis sulfureis vel albis differt. Type: C. V. Morton 5252.

Pitcairnia sulphurea Andr. Bot. Repos. 4: pl. 249. 1802. P. spicata var. sulphurea Mez in DC. Mon. Phan. 9: 393. 1896.

ST. VINCENT: Mountains above Chateaubelair River, alt. 400-750 m, 23 April 1947, C. V. Morton 5252 (US, type).

RONNBERGIA

RONNBERGIA HATHEWAYI L. B. Smith, sp. nov. A R. killipiana L. B. Smith, cui valde affinis, foliis subpetiolatis integerrimis, sepalis subduplo minoribus differt.

PLANT stoloniferous, known only from fruiting material.

LEAVES few, fasciculate, to 7 dm long, much exceeding the inflorescence, entire, pale-lepidote beneath; sheaths narrowly triangular; blades linear-lanceolate, acuminate, subpetiolate to 35 mm wide, thin, channeled. SCAPE curved, 2 mm thick, glabrous in age scape-bracts imbricate, lanceolate, acuminate, green, thin. INFLORESCENCE simple, sublux, 4-5 cm long, glabrous with age; floral bracts suborbicular, 4 mm long; flowers spreading. SEPALs 4 mm long with a large suborbicular wing overtopping the apex,

unarmed, connate for 2 mm. FRUIT globose, 9 mm long, dark blue with numerous conspicuous pale ribs. Pl. III, fig. 33: Fruit x 1; fig. 39: Sepal x 1.

COSTA RICA: Cartago: In very wet complex forest of Chrysophyllum, Billia, Callophyllum, Vochysia, Mouriri, and Engelhardtia, Valle Escondido, between Tuis and Siquirres, alt. 500 m, 25 March 1966, W. H. Hatheway 1706 (US, type); same, 1707 (US).

STREPTOCALYX

STREPTOCALYX SUBNUDA L. B. Smith in R. E. Schultes, Bot. Mus. Leaflet. Harvard Univ. 17: 73, fig. 1955. S. holmesii J. Holmes, Brom. Soc. Bull. 15: 93 (color plate). 1965. Nomen.

PERU: Vicinity of Iquitos (?), Lee Moore s. n., cultivated January 1967, J. Marnier-Lapostolle 34 (US).

TILLANDSIA

TILLANDSIA FASCICULATA Sw. var. FLORIDANA L. B. Smith, var. nov. A var. fasciculata spicis pluribus minoribus, bracteis floriferis tenuiter coriaceis lepidotis differt.

INFLORESCENCE of several small spikes as in the common var. densispica Mez of Florida; floral bracts thin-coriaceous, lepidote.

UNITED STATES: Florida: Osceola County: Epiphytic on Taxodium, near Holopaw, alt. 15 m, 23 March 1953, M. B. Foster 2820 (US, type).

VRIESEA

VRIESEA DUBIA (L. B. Smith) L. B. Smith, comb. nov. Tillandsia dubia L. B. Smith, Phytologia 5: 284, pl. 2, fig. 4, 5. 1955; Brom. Colombia in Contr. U. S. Nat. Herb. 33: 133, fig. 38. 1957.

FLORAL BRACTS scarlet-red. PETALS white (! Vogel), narrow, bearing 2 narrow acute highly adnate scales at base. STAMENS included.

COLOMBIA: Nariño: Epiphytic along trail north of Puerto Leguízamo, alt. 200 m, 22 November 1948, Jaramillo-Mejía 571 (COL, type; US phot.). Caquetá: Epiphytic in tropical rainforest, Florenzia, alt. 150 m, 16 April 1956, Stefan Vogel 3 (Mainz, US).

Thanks to the in vitro material of Professor Stefan Vogel of Mainz, it is now possible to confirm the suspicion that led me to give this species the name "dubia" in the first place. It has been keyed (subkey V, lead 17 (1)) already in my revision of Vriesea in Phytologia 13: 84. 1966.

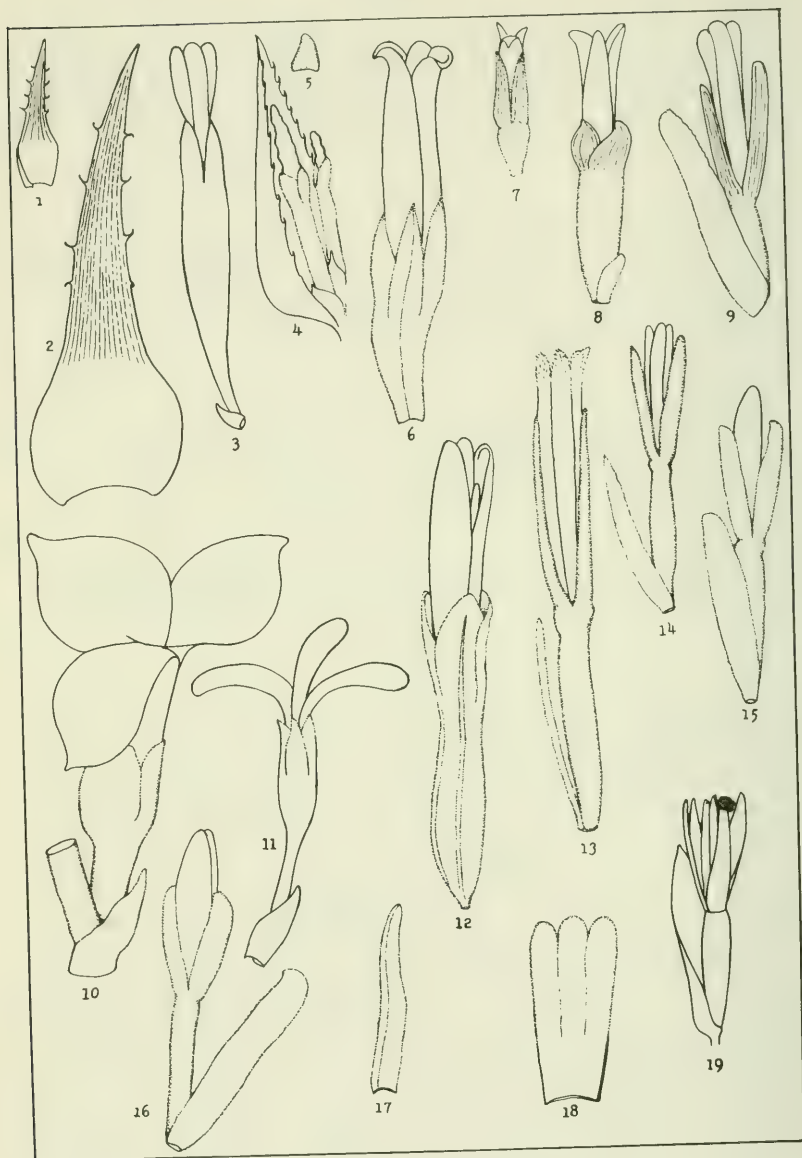


Fig. 1: *Abromeitiella brevifolia*. 2: *A. lorentziana*.
3-19: *Bromelia* species, cf. text.

Plate II

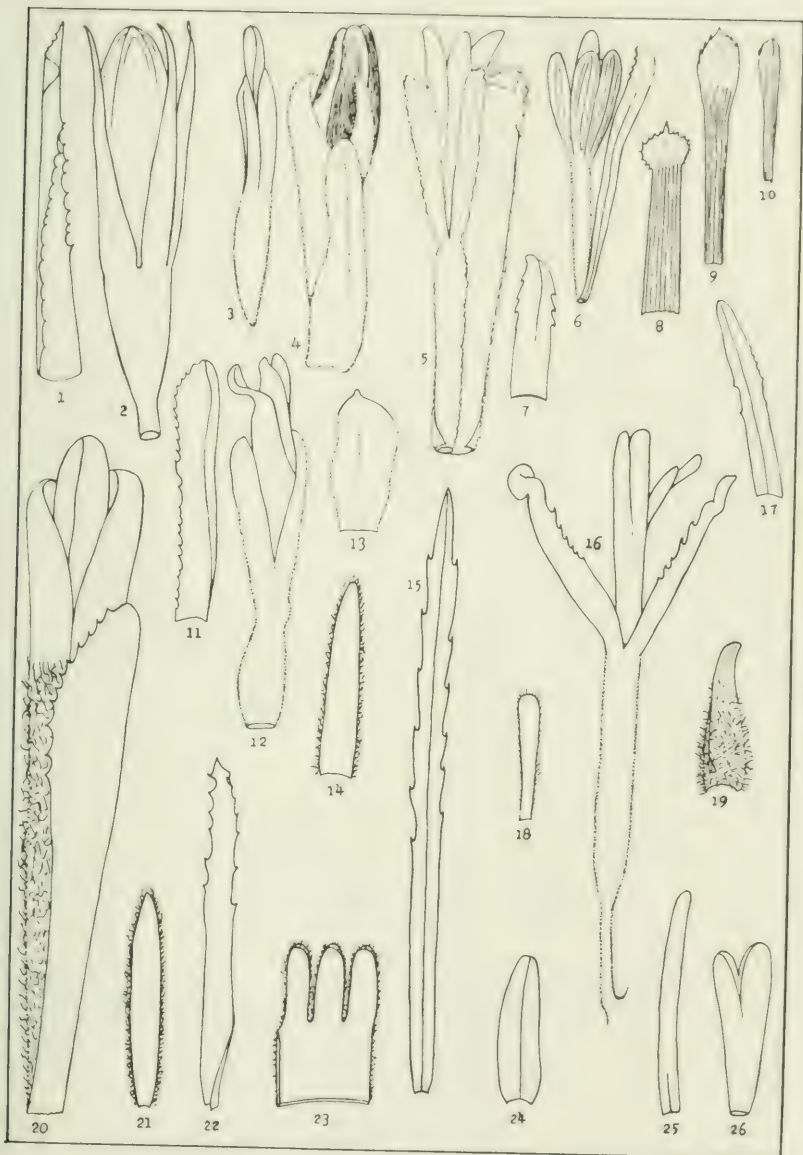


Fig. 1-26: Bromelia species, cf. text.

Plate III

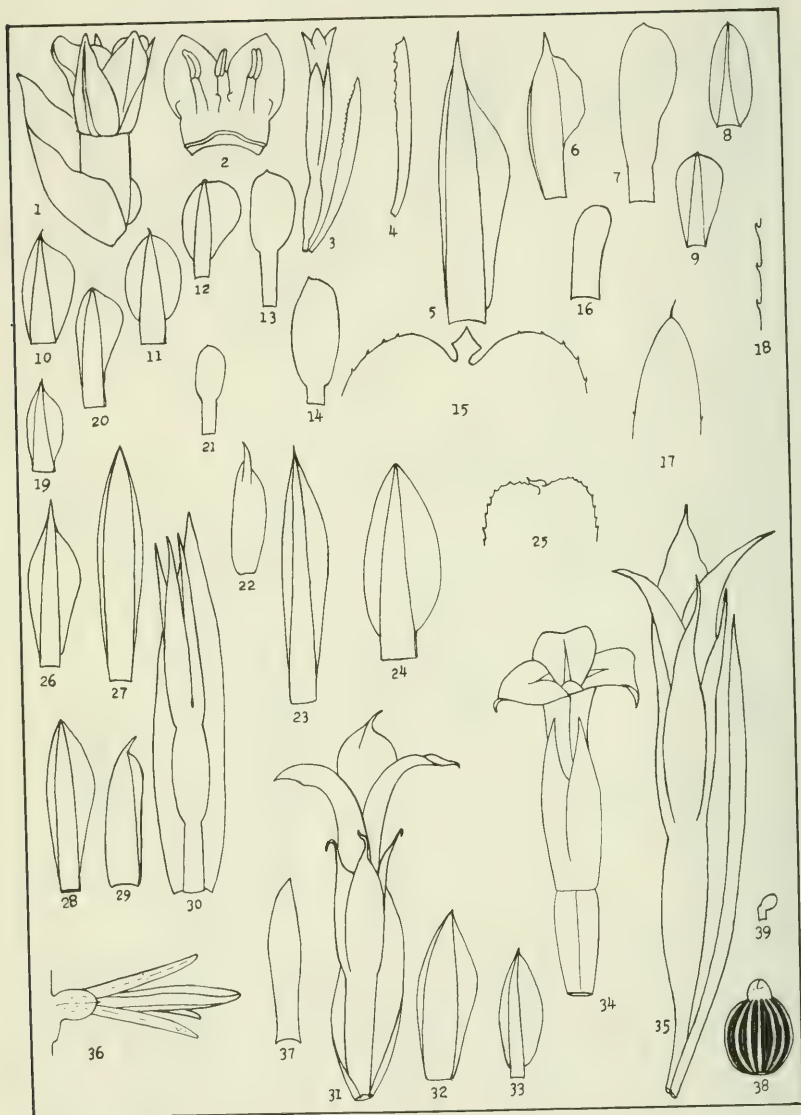


Fig. 1, 2: *Bromelia urbaniana*. 3-35: *Neoregelia* species,
cf. text. 36, 37: *Pitcairnia ellenbergii*.
38, 39: *Ronnbergia hathewayi*.

ICONOGRAPHIA CYPERACEARUM I.*

Tetsuo Koyama

The New York Botanical Garden

Introduction

Since the differentiation of the sedges depends almost exclusively upon the minute floral characters, which are difficult to be adequately expressed in writing, precise drawings in coordination with technical descriptions are the most useful means of identification of the cyperaceous plants. For this reason, some cyperologists have made special effort to illustrate the Cyperaceae they handled as seen in such publications as "The Illustrations of the Genus *Carex*" (1858-67) by F. Boott, "Illustrations of Cyperaceae" (1909) by C. B. Clarke, or "North American Cariceae" (1940) by K. K. Mackenzie.

In 1949 I have started preparation of the illustrations of Cyperaceae with Asiatic representatives primarily to supplement my fully descriptive taxonomic account of eastern Asiatic Cyperaceae of some 1,200 pages of typescript. At that time, however, publication of such a voluminous paper was hardly possible, and only its framework was printed in 1961-62 in the Journal of the Faculty of Science, the University of Tokyo, Volume 8, Parts 3 and 4, leaving out most illustrations and taxonomic technical descriptions. The illustrations and descriptions, which the present series of paper begins with, were thus made some twenty years ago, and were slightly edited since I joined the staff of the New York Botanical Garden. Ten to twenty plates are planned to be presented in each part, and a special emphasis will be given to Asiatic and South American representatives as they constitute the most poorly illustrated portions of the family.

I would like to express my appreciation to Fräulein Ilona Kirchner, who so ably typed my sometimes difficult manuscript.

* Study supported in part by the National Science Foundation Grant, GB-4012.

Plate 1. CAREX PACHYGYNA Franchet & Savatier

Carex pachygyna Franchet & Savatier, Enum. Pl. Japon. 2: 133, 1877 & 560, 1879.

For synonyms see T. Koyama, Journ. Fac. Sci. Univ. Tokyo, III, 8 (4): 233, 1962.

Rhizome creeping, ligneous, thickened at base of shoots; the internodes 1-2.2 mm long, 2-3 mm thick, clothed with reddish brown scales. Leaves radical, fascicled, narrowly lance-obovate to lanceolate, 8-15 cm long, 1-2 cm wide, weakly inverted-W-shaped with 3 costas and many longitudinal nerves, herbaceous, fresh green, glabrescent or occasionally puberulent, subabruptly narrowed to an acute apex, gradually attenuated to hardly sheathing base; bladeless sheaths at base of shoots few, membranous, brownish or reddish-brownish. Culms lateral, arising from previous year's shoots, usually solitary, 15-30 cm tall, 4-6-noded, smooth, three-sided, bearing spikes from below the middle. Bracts an infaltd sheath, 1-2 cm long, obliquely truncate at apex occasionally with a short deltoid elongation of the dorsal portion. Spikes 2- or 3-nate, androgynous, subglobose, 4-6 mm long and as wide, densely many-flowered; the peduncles erect, unequal in length exserted beyond the sheath. Pistillate glumes ovate-orbicular, 2 mm long, membranous, pale with a broad green costa, rounded to often mucronulate apex; the costa obscurely 3-nerved. Utricles surpassing glume, patent, obovoid or obovoid-ellipsoidal, 2-2.5 mm long, 3-sided, becoming dark green at maturity, herbaceous, many-nerved, glabrous, cuneate-attenuate at base, subabruptly contracted above to a truncate orifice; beak not developed. Achenes tightly inclosed, broadly elliptic, 1.7 mm long, 3-sided, contracted at both ends; style very short; stigmas 3, short, less than 1 mm long.

Voucher specimen. T. Koyama 6867. Japan. Nara Prefecture, the Akame 48 Falls (NY).

Distribution. Relatively poorly vegetated forest bed or half-open scrub slope. Locally occurring in western Japan from Kinki District westwards to Yamaguchi Prefecture, and in Shikoku Island.

Explanation of Plate 1. A, habit. B, portion of leaf blade. C & D, dorsal and ventral views of prophyll. E, staminate glume. F, stamen. G, utricle at anthesis. H, pistillate glume. I, dorsal view of mature utricle. J, orifice of utricle. K, transverse section of utricle. L, dorsal view of achene. Scales for Figs. H, I and L = 1 mm.

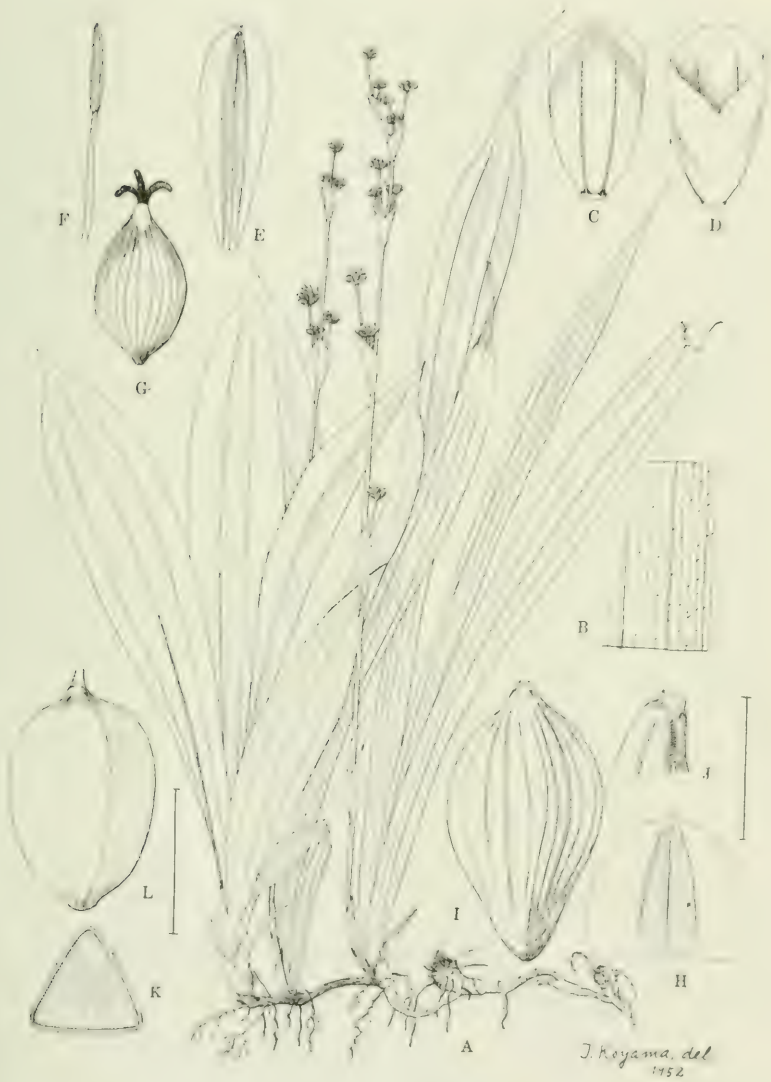


Plate 1. *Carex pachygyna* Franchet & Savatier

Plate 2. CAREX SIDEROSTICTA Hance

Carex siderosticta Hance, Journ. Linn. Soc. 13: 89, 1873.

For synonyms see T. Koyama, Journ. Fac. Sci. Univ. Tokyo, III 8 (4):232, 1962.

Perennial herb with long-creeping slender stolons; the stolons ca. 1 mm thick, clothed with brownish scales soon disintegrating into fibers, the internodes 1-2 cm long. Leaves radical, fasciculated in sterile herbaceous, soft, weakly inversely W-shaped in transverse section with 3 costas, light green, glabrous or minutely puberulent, gradually narrowed to acute apex, gradually attenuate below to often reddish-purplish-tinged base, hardly sheathing; a few basal sheaths cataphylloid, light purplish-brown or cinnamon-colored. Culms lateral, few arising from rhizome neck of previous year's shoots, 14-40 cm tall, slender, 3-sided, smooth throughout, 4- to 6-noded, bearing inflorescence from below the middle. Bracts a slightly inflated bladeless sheath, 1-1.7 cm long, the mouth obliquely truncate with white or slightly brown-tinged membranous margin; rarely the dorsal portion of sheaths slightly elongated into short blade. Spikes on exserted erect peduncle, bisexual, cylindrical, single or binate, sometimes in part further branched; the staminate portion clavate, light brown, 1-1.2 cm long, many-flowered; the pistillate portion sparsely with several flowers. Pistillate glumes elliptic, 3.5-4 mm long, membranous, pale-green and occasionally brownish-maculate on both margins, with a broad green 3-nerved costa on back, contracted to mucicous apex. Utricles slightly shorter than glume, obovoid-ellipsoidal, 3-3.5 mm long, 3-sided, thinly herbaceous, light or yellow-green, finely many-nerved, glabrous, subabruptly contracted to round apex, cuneate-attenuate to base with a very short stipe, the beak hardly developed. Achenes tightly enclosed, broadly elliptic to nearly orbicular, 3-sided, 2.5-2.75 mm long, contracted at both ends; style very short; stigmas 3, linear, 3 mm long, reddish-purplish.

Voucher specimen. T. Koyama 6787. Japan, Tokyo Prefecture, Momonokidaira near Asakawa, 700 m alt. (NY).

Distribution. Undergrowth of temperate deciduous forest, from southeastern Hokkaido through the Mainland, Shikoku and Kyushu of Japan eastwards to southern Manchuria and southeastwards to northern China Proper.

Explanation of Plate 2. A, habit. B, marginal portion of leaf blade. C, ligule. D, spike. E, staminate flower and its glume. F, pistillate flower and its glume. G, pistillate glume at maturity. H, dorsal view of mature utricle. I, dorsal view of achene. Scales for Figs. G, H and I = 1 mm.

Forma variegata (Akiyama) T. Koyama, Journ. Fac. Sci. Univ. Tokyo III, 8 (4): 232, 1962, a wild form with white-striped leaf-blades, is occasionally cultivated in Japan as an ornamental grass.



Plate 2. Carex siderosticta Hance

Plate 3. CAREX CILIATO-MARGINATA Nakai

Carex ciliato-marginata Nakai, Repert. Sp. Nov. 13: 244, 1916.

Synonym. Carex siderosticta Hance var. pilosa Léveillé ex Nakai, l. c., 244, 1916. Invalid name in synonymy.

Whole plant densely and minutely punctulate with purple-brown. Perennial herb with slender rhizome clothed with brown fibers; stolons slender, obliquely ascending, the internodes ca. 1 mm thick, 1-2 cm long. Leaves fascicled, lance-oblong, oblanceolate or lanceolate, 1-1.5 cm wide, 8-15 cm long at anthesis and later elongated to 25 cm, surpassing culms, herbaceous, weakly inversed-W-shaped in transverse section, 3-costate, green or light green, puberulent with short soft hairs on both sides, densely ciliate with white hairs on entire margin, acute at apex, gradually attenuated below to more or less brownish-purplish-tinged base, hardly sheathing. Culms lateral, few to a clump, 6-12 cm tall, slender, sparsely puberulent with short soft hairs, 3- or 4-noded, bearing spikes from the second node to apex. Bracts spathe-like, sheathing to 5-7 mm, pubescent especially toward the base. Spikes single at each node; the terminal one staminate, oblong or obovate-oblong, 5-8 mm long, 2-3.5 mm thick, pale-green; the lateral ones bisexual with a short staminate part and 3-6 pistillate flowers; the pistillate flowers rather contiguous; peduncles nearly inclosed in or slightly exerted beyond the sheathing portion of bract. Pistillate glumes ovate, 2.5-3 mm long, pale and membranous on both sides, light green on 3-nerved costa, contracted to muticous apex. Utricles nearly as long as glume, 3-3.5 mm long, obovoid, obscurely 3-sided, herbaceous, greenish, many-nerved, wholly pubescent, contracted above to a very short beak, cunate attenuate at base. Achenes tightly inclosed in utricle, elliptical, 3-sided, 1.6 mm long; style short; stigmas 3-4 mm long, filiform, purplish.

Voucher specimen. T. Koyama 5998. Japan. Mainland, Uri-pass at Aichi and Shizuoka border, 350 m alt. (NY).

Distribution. Relatively dry herbose or scrub frequently on serpentine or calcareous rocks. Pacific side of the Mainland of Japan from Shizuoka Prefecture through Kii Peninsula westwards to Hiroshima Prefecture, and southwestwards to Shikoku Island; Tsushima Islands; Korea and adjacent Manchuria.

Explanation of Plate 3. A, habit. B, portion of leaf blade. C, hairs of leaf margin. D, portion of culm. E, lateral spike and its bract. F, terminal staminate spike. G, staminate glume and staminate flower. H, pistillate flower with glume. I, pistillate glume at maturity. J, dorsal view of mature utricle. K, ventral view of mature utricle. L & M, dorsal and ventral views of utricular beak. N, dorsal view of achene. Scale for Figs. I, J, K and N = 1 mm.



Plate 3. *Carex ciliato-marginata* Nakai

Plate 4. CAREX OKAMOTOI Ohwi

Carex Okamotoi Ohwi, Acta Phytotax. Geobot. 5: 23, 1936.

Rhizome with long creeping stolons, clothed with brownish scales, the internodes 1-1.8 cm long, 1.5 mm thick. Leaves broadly linear to linear-lanceolate, 10-28 cm long, 4-8 mm broad, light green, soft, herbaceous, 3-costate, acute at apex, gradually attenuate below to pale brown short-sheathing base; ligule auriculate, 1-2 mm long, shallowly bifid at dorsal portion, densely maculate with brownish minute dots, a few basal sheaths bladeless, cinnamon-brownish. Culms lateral, 13-18 cm tall, slender, 3-sided, smooth, 4- or 5-nodose, bearing spikes from below the middle. Bracts a bladeless sheath, slightly spathiform, 1-2 cm long, greenish. Spikes single, on slender exserted peduncle; the terminal on staminate, oblanceolate or oblong, 8-10 mm long; lateral ones bisexual, 1-2.5 cm long, the staminate portion oblong, 5 mm long, the pistillate portion remotely with 2- to 4-flowered. Pistillate glumes broadly elliptical, 2.25-2.5 mm long, pale, contracted above to acutish apex, broadly whitish membranous on margins, the costa broad, green, obscurely 3-nerved. Utricles about as long as or slightly exceeding the glume, broadly obovate or almost orbicular-obovate, 2.5 mm long, 3-sided, herbaceous, pale-green, glabrous, distinctly several-nerved, contracted at short-stipitate base, rounded above to very short slightly recurved beak. Achenes tightly inclosed, broadly elliptic to nearly suborbicular, 2-2.25 mm long, 3-sided; stigmas 3.

Voucher specimen. J. Ohwi, 7253. Korea, Mt. Chiisan.

Distribution. Rare in forest. Known only from Mt. Chiisan in Korea, the type locality.

Explanation of Plate 4. A, habit. B, marginal portion of leaf blade. C, orifice of leaf sheath showing ligule. D, portion of culm. E, prophyll. F, staminate glume. G, pistillate glume. H, I, dorsal and ventral views of mature utricle. J, K, two views of utricular orifice. L, dorsal view of mature achene. Scale for Figs. G, H, I and L = 1 mm.

Note. Carex Okamotoi and the following species, Carex tumidula, appear to be closely related to Carex grandiligulata Kükenthal and Carex glossostigma H.-Mazzetti of northern China Proper especially in the well-developed ligules and narrow leaves. Both of these Chinese sedges poorly collected and no adequate materials are available for illustrations.

Plate 4. *Carex okamotoi* Ohwi

Plate 5. CAREX TUMIDULA Ohwi

Carex tumidula Ohwi, Mem. Coll. Sci. Kyoto Imp. Univ. B, 6: 244, 1931.

Perennial with long creeping slender rhizomes clothed with ferrugineous scales. Leaves linear, 2-3 mm wide, 10-40 cm long, surpassing culms, 3-costate; the sheath up to 8 cm long, tinged with ferrugineous brown, puberulent with short hairs; ligule ca. 1 mm long. Culm lateral, 15-30 cm tall, slender, smooth, clothed at base with a few short-bladed sheaths, 3- or 4-nodose, bearing spikes from the middle. Bracts with elongate blade, long-sheathing; the blade shorter than or surpassing spike. Spikes single or binate, sometimes branched, bisexual or sometimes the terminal one staminate; staminate part clavate, ferrugineous; pistillate part loosely with 2 to 4 flowers; peduncles inclosed or slightly exserted beyond the bract sheath. Staminate glume obovate, ferrugineous-tinged, broadly white-membranous on upper margin. Pistillate glumes ovate-elliptical, 2.5 mm long, acutish or obtusish at apex, tinged with ferrugineous brown, 3-nerved at costa. Utricles slightly longer than glume, ellipsoidal, 3 mm long, obtusely 3-sided, membranous, dull green with minute ferrugineous punctulations, prominently 2-costate, faintly nervulose, subabruptly attenuate above to a slightly recurved bent beak at apex, contracted below to a cunate base. Achenes tightly inclosed, obovate-elliptic, 3-sided, 2 mm long, abruptly attenuate to both ends; style elongated, stigmas 3.

Voucher specimen. I. Yogo, s.n. Japan, Shikoku, Mt. Kurotaki (KYO).

Distribution. Known only from two localities in Ehime Prefecture, northern Shikoku, Japan.

Explanation of Plate 5. 1, habit. 2, portion of leaf blade. 3, 4, ventral and lateral views of the upper part of leaf sheath showing ligule. 5, lateral spikes. 6, staminate glume. 7, stamen. 8, pistillate glume. 9, 10, dorsal and lateral views of mature utricle. 11, transverse section of utricle. 12, dorsal view of achene. Scale for Figs. 6, 8, 9, 10 and 12 = 1 mm.

Plate 6. CAREX FILIPES Franchet & Savatier

Carex filipes Franchet & Savatier, Enum. Pl. Japon. 2: 148, 1877 & 576, 1879.

spp. filipes.

Soft perennial tufted in large clumps. Leaves many, radical, linear 10-20 cm long, 2-4 mm broad, flattish, fresh green or slightly glaucous, soft, thinly herbaceous, subabruptly acute at apex; the sheath dark purple



Plate 5. Carex tumidula Ohwi



Plate 6. *Carex filipes* Franchet & Savatier

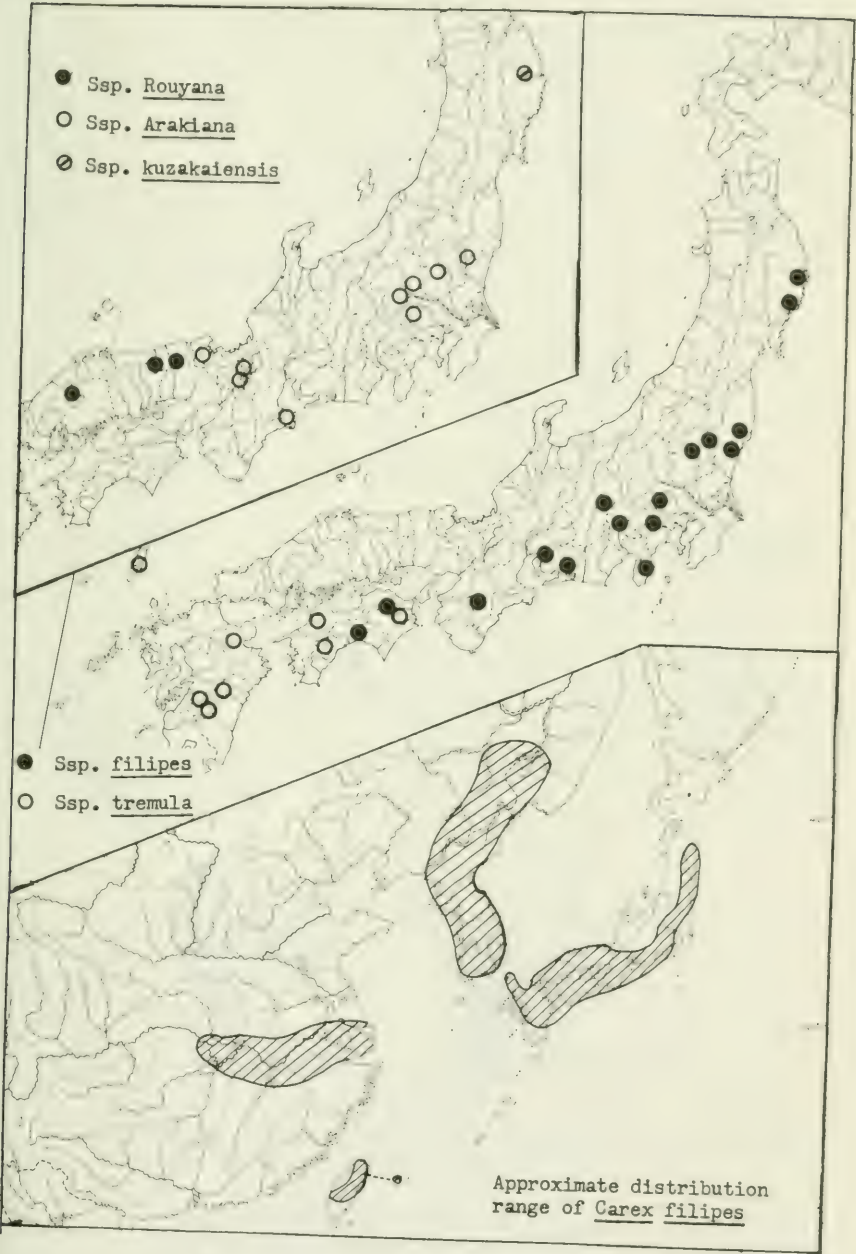


Figure 1. Distribution of Carex filipes



Plate 7. *Carex filipes* ssp. *tremula* T. Koyama

or purple-brown. Culms many, 25-40 cm tall, triquetrous, smooth, soft, mostly 2-noded, internodes elongated. Spikes 3 sometimes 4, occasionally the lowest one subbasal; terminal staminate and next pistillate ones contiguous, the other pistillate one distant; staminate spikelet linear-oblong, 1-1.5 cm long, usually purplish or purple-brown, erect on short peduncle almost inclosed in the uppermost bract-sheath; pistillate spikes loosely 3- to 5-flowered on filiform short-exserted peduncle, surpassed by the bract-blade. Bracts leaf-like, long-sheathing. Pistillate glumes broadly ovate, thinly membranous, 3-3.5 mm. long, pale and often tinged with purplish-brown above; costa green, more or less 3-nerved, making a short mucro at acute apex. Utricles longer than glume, ovoid-fusiform, 3-sided, 5-6 mm long, light green, glabrous, in addition to 2 distinct costas faintly many-nerved, contracted to cuneate base, gradually tapering above into a long beak, the orifice obliquely truncate, occasionally somewhat 2-toothed. Achene tightly inclosed in the lower part of utricle, obovate, 2.5 mm long, 3-sided; style slender, elongated; stigmas 3, filiform.

Voucher specimen. T. Koyama s.n. 13 May 1951. Japan, Mainland, Saitama Prefecture, Mt. Buko, 1000 m (NY).

Distribution. Slightly wet ground of half-shaded temperate forest. Pacific Side of the central part of Mainland Japan, from Kanto District westwards to eastern Kinki District, and Shikoku Island.

Explanation of Plate 6. A, habit. B, C, portion of leaf blade. D, orifice of leaf sheath showing ligule. E, portion of culm. F, staminate spikelet. G, staminate glume. H, prophyll. I, utricle with pistillate glume at anthesis. J, pistillate glume. K, L, dorsal and ventral views of mature utricle. M, N, dorsal and ventral views of utricular orifice. O, achene. Scale for Figs. J, K, L and O = 1 mm.

Plate 7. CAREX FILIPES ssp. TREMULA T. Koyama

Carex filipes Franchet & Savatier ssp. tremula (Ohwi) T. Koyama, stat. nov.

Synonym. Carex arisanensis Hayata var. tremula Ohwi, Mem. Coll. Sci. Kyoto Univ. B, 5: 255, 1930.

Carex tremula (Ohwi) Ohwi, Acta Phytotax. Geobot. 2: 28, 1933.

Carex filipes Franchet & Savatier var. tremula (Ohwi) Ohwi, Mem. Coll. Sci. Kyoto Univ. B, 11 (5): 423, 1936.

Resembling Carex filipes ssp. filipes, but smaller. Culms 10-25 cm tall. Leaves abruptly acute at apex. Spikes usually 3; terminal one staminate, small oblong, 5-8 mm long, not prominently colored, always surpassed by the next pistillate spike, the peduncle short, inclosed in the

uppermost bract-sheath; pistillate spikes 2- to 4-flowered, flowers more contiguous than in ssp. filipes. Pistillate glumes broadly ovate, about half as long as utricule, obtusish at apex.

Voucher specimen. K. Mayebara 180. Japan, Kyushu, Kumamoto Prefecture, Mt. Ichifusa (NY).

Distribution. Undergrowth of temperate forest. Shikoku and Kyushu Islands of western Japan.

Explanation of Plate 7. A, habit. B, orifice of leaf sheath showing ligule. C, apical two spikes with the uppermost bract. D, staminate glume. E, prophyll. F, pistillate glume. G, H, dorsal and lateral views of mature utricule. I, dorsal view of achene. Scale for Figs. F - I = 1 mm.

Plate 8. *CAREX FILIPES* ssp. *ARISANENSIS* T. Koyama

Carex filipes Franchet & Savatier ssp. arisanensis (Hayata) T. Koyama, Journ. Jap. Bot. 29: 41, 1954.

Synonyms. Carex arisanensis Hayata, Mater. Fl. Formosa, 6: 130, t. 18, 1916.

Carex filipes Franchet & Savatier var. arisanensis (Hayata) T. Koyama, Journ. Fac. Sci. Univ. Tokyo, III, 8 (4): 228, 1962.

Differing from Carex filipes ssp. filipes chiefly by the broader leaf blades gradually acute at apex, lateral spikes surpassing the bract and the longer beak of utricles.

Tufted in large clumps. Leaves linear, shorter than or exceeding culms, 20-40 cm long, 4-6 mm wide, soft, herbaceous, 3-costate, gradually narrowed to long acuminate apex, gradually tapering below to slender sheath often colored with dark brown or purple brown; some basal sheaths bladeless. Culms sublateral, (20-) 25-45 cm long, slender, 3-sided, smooth, 2- or 3-noded. Spikes 2 or 3, the terminal staminate and the next pistillate contiguous, the third very distant; staminate spike lance-oblong, short, 4-7 mm long, surpassed by the next pistillate spike; pistillate spikes oblong subdensely with several flowers, 6-10 mm long; peduncles slender, erect, long-exserted beyond the bract-blade. Bract short-bladed, the sheath up to 4 cm long. Pistillate glumes ovate-oblong 3-4 mm long, pale, occasionally tinged with brown, the costa green, obscurely 3-nerved, ending at muticous or mucronulate apex of glume. Utricles about twice as long as glume, 5.5-6.25 mm long, fusiform, 3-sided herbaceous, 2-costate and faintly many-nerved, cuneate at base, narrow to a long upright beak. Achene tightly inclosed in the lower part of the utricule, obovate-elliptic, 3-sided, 3 mm long; style elongate; stigmas 3.



PLATE 9. *Carex filipes* var. *arvensensis* T. Koyama.

Voucher specimen. J. Ohwi 662. Formosa, Taipei Hsien, Agyoku in Monsan County (NY).

Distribution. Undergrowth of warm-temperate forest at high altitude in Formosa.

Explanation of Plate 8. A, habit. B, marginal portion of leaf blade. C, ligule. D, the uppermost two spikes and bract. E, staminate glume. F, G, two views of prophyll. H, pistillate glume. I, dorsal view of utricle. J, K, two views of utricular orifice. L, dorsal view of achene with style. Scale for Figs. H, I and L = 1 mm.

Plate 9. CAREX FILIPES ssp. ROUYANA T. Koyama

Carex filipes Franchet & Savatier ssp. Rouyana (Franchet) T. Koyama, Journ. Jap. Bot. 29: 42, 1954.

Synonyms. Carex Rouyana Franchet, Bull. Soc. Philom. Paris, 8^e sér., 7: 51, 1895.

Carex sparsinix C. B. Clarke ex Franchet, Nouv. Archiv. Muséum, 3^e sér., 10: 66, 1898.

Carex filipes Franchet & Savatier var. sparsinix (C. B. Clarke ex Franchet) Kükenthal, Pflanzenr. 4 (20): 639, 1909.

Carex filipes Franchet & Savatier var. Rouyana (Franchet) Kükenthal l. c., 640, 1909.

Differing from Carex filipes ssp. filipes by the larger staminate spike, which surpasses the uppermost pistillate spike, the brown color of staminate glumes and basal sheaths, and longer beak of utricles.

Tufted in large clumps. Leaves many, linear, 3-6 mm wide, subabruptly acute at apex; basal sheaths brown. Culms 30-50 cm tall, remotely 3-nodose. Spikes 3 (rarely 4); terminal spike staminate, oblong-cylindrical, 1.5-2.5 cm long, 3 mm thick, surpassing the highest pistillate spike, the peduncle long-exserted; staminate glumes, brown and whitish-margined; lateral spikes pistillate, loosely 5- to 8-flowered, slightly inclined to pendant on capillary peduncle. Bracts short-bladed, sheathing. Pistillate glumes broadly ovate, thinly membranous, 3/5 as long as utricle, brownish-tinged on both sides, mucous at apex. Utricles 5.5-6.5 mm long, fusiform, 3-sided, 2-costate and finely many-nerved, cuneate at base, contracted above to a long beak, obliquely truncate at orifice. Achenes tightly inclosed in the lower part of utricle, elliptic-obovate, 3 mm long.

Voucher specimen. T. Koyama 6790. Japan, Mainland, Tochigi Prefecture, foot of Mt. Kogashi, 600 m. (NY).

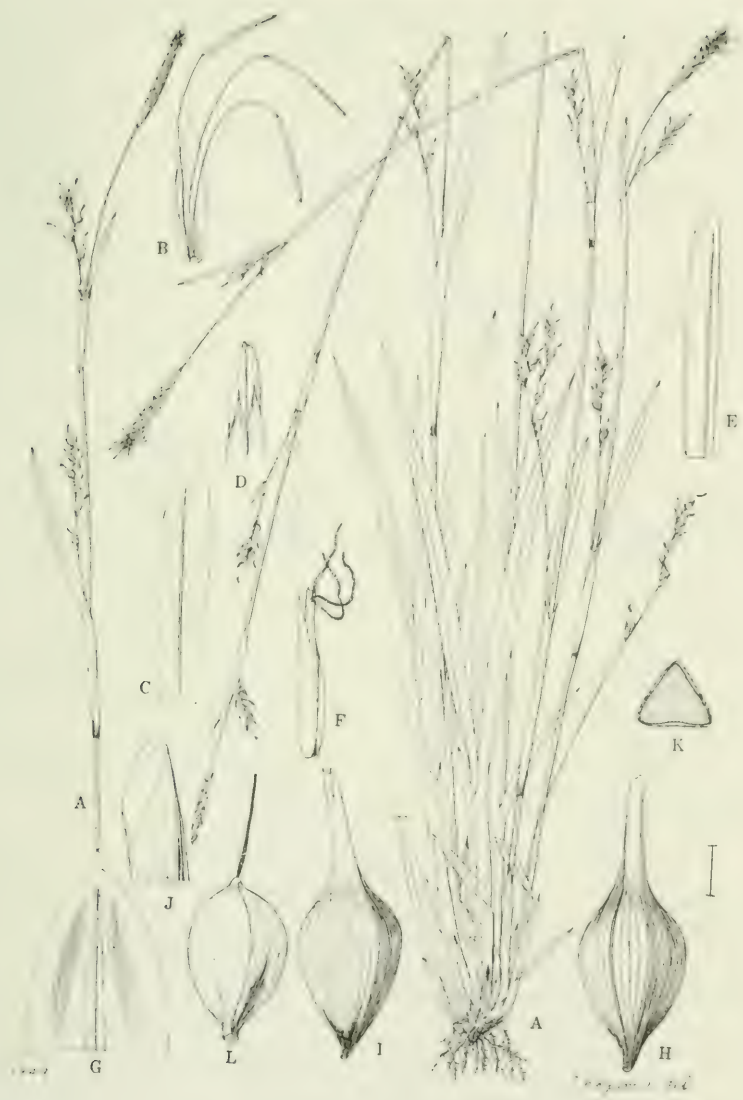


Plate 9. *Carex filipes* ssp. *rouyana* T. Koyama

Distribution. Slightly wet ground of temperate forest. Pacific side of Central Japan from Kwanto District southwestwards to Yamaguchi Prefecture, and the Yantze River Valley of central China.

Explanation of Plate 9. A, habit. B, staminate flower with glume. C, staminate glume. D, anther apex. E, prophyll. F, pistillate flower with utricle and glume. G, pistillate glume. H, I, dorsal and ventral views of mature utricle. J, utricular orifice. K, transverse section of utricle. L, dorsal view of mature achene. Scale for Figs. G, H, I and L = 1 mm.

Note. Carex sparsinux C. B. Clarke from central China hardly differs from Japanese ssp. Rouyana.

Plate 10. CAREX FILIPES ssp. OLIGOSTACHYS T. Koyama

Carex filipes Franchet & Savatier ssp. oligostachys (Meinshausen ex Maximowicz) T. Koyama, stat. nov.

Synonyms. Carex oligostachys Meinshausen ex Maximowicz, Mel. Biol. 12: 566, 1886.

Carex egena Leveille & Vaniot, Repert. Sp. Nov. 4: 227, 1907.

Carex filipes Franchet & Savatier var. oligostachys (Meinshausen ex Maximowicz) Kükenthal, Pflanzenr. 4 (20): 641, 1909.

Differing from both ssp. filipes and ssp. Rouyana by much larger plant, broader leaves as much as 13 mm in width, and deltoid-ovate pistillate glumes only half as long as utricle.

Perennial with short rhizome. Leaves broadly linear, 9-13 mm wide soft, herbaceous, glaucous-green; some basal sheaths brown-tinged or purplish-brownish. Culms up to 60 cm tall, remotely 3- or 4-nodose. Spikes usually 3; terminal spike staminate, short-cylindrical, brown or purplish-brown, much surpassing the highest pistillate spike, the pedunc long-exserted, upright; lateral spikes 2 or 3, pistillate, inclined or pendant on capillary peduncle long-exserted beyond the bract, loosely several-flowered. Bracts with well-developed blade, long-sheathing. Pistillate glumes deltoid-ovate, half as long as utricle, thinly membranous, purplish-brownish-tinged on both sides, pale-margined, contracted to acutish apex, the costa obscurely 3-nerved. Utricles fusiform, 3-sided, 6 mm long, cunate at base, tapering above to a long beak, obliquely truncate at orifice. Achenes 2.5-3 mm long, obovate-elliptical, 3-sided

Voucher specimen. J. Ohwi 136. Korea, Mt. Diamantino.(NY).

Distribution. Temperate forest of Korea, Ussuri and southern Manchuria, relatively sporadic.

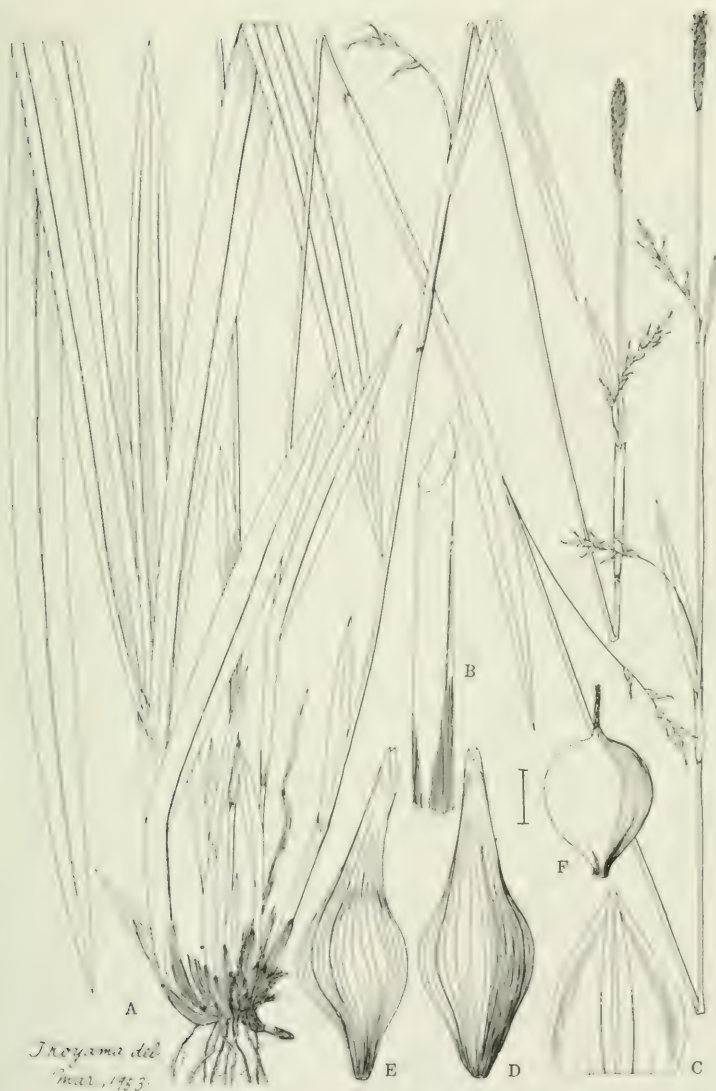


Plate 10. *Carex fillipes* ssp. *oligostachys* T. Koyama

Explanation of Plate 10. A, habit. B, prophyll. C, pistillate glume. D, E, dorsal and lateral views of mature utricle. F, dorsal view of achene. Scale for Figs. C, D and E = 1 mm.

ADDITIONAL NOTES ON THE GENUS VITEX. IV

Harold N. Moldenke

VITEX Tourn.

Additional & emended synonymy: Wallrothia Roth, Nov. Pl. Sp. 317. 1821 [not Wallrothia Spreng., 1815]. Allazia Silva Manso, Enum. 36. 1836. Agnus-castus [Tourn.] Carr. ex Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 1: 59, in syn. 1893. Agnus-castus Carr. ex Airy-Shaw in Willis, Dict. Flow. Pl., ed. 7, 32, in syn. 1966. Ephialis "Banks & Soland. ex A. Cunn." apud Airy-Shaw in Willis, Dict. Flow. Pl., ed. 7, 408, in syn. 1966. Ephialum Wittst. ex Airy-Shaw in Willis, Dict. Flow. Pl., ed. 7, 409, in syn. 1966. Mailelou Adans. ex Airy-Shaw in Willis, Dict. Flow. Pl., ed. 7, 687, in syn. 1966. Varangevillea Willis (in part) ex Airy-Shaw in Willis, Dict. Flow. Pl., ed. 7, 1173, in syn. 1966.

Additional & emended bibliography: N. L. Burm., Fl. Ind. 138, pl. 43, [fig. 2]. 1768; W. Jones, Treat. Pl. Ind. 5: 136. 1790; Hook., Bot. Misc. 285. 1830; A. Cunn., Ann. Nat. Hist., ser. 1, 1: 461—462. 1838; W. Jack, Calc. Journ. Nat. Hist. 4 (13): 40. 1843; Benth., Bot. Voy. Sulph. 154—155. 1846; Ettingsh., Blatt-Skel. Dikot. 79, pl. 32, fig. 6 & 8. 1861; Beddome, Forester's Man. Bot. S. Ind. 171. 1873; Roxb., Fl. Ind., repr. ed. Carey, 476—482. 1874; Boiss., Fl. Orient. 4: 535. 1879; Murray, Pl. & Drugs Sind 175. 1881; E. T. Atkinson, Him. Dist. Statist. Acct. NW. Prov. 10: 315 & 753. 1882; Aitch., Journ. Linn. Soc. Lond. Bot. 19: 182. 1882; Campbell & Watt, Descrip. Cat. Econom. Prod. Chutia Nagpur No. 8498. 1886; H. O. Forbes, Wand. Naturforsch. Malay. Arch. 2: 226. 1886; S. Elliot, Ann. Bot. 5: 376, pl. 22, fig. 119. 1891; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 1: 59, 77, 297, 304, 447, 529, 582, 619, & 844 (1893), 2: 83 & 308 (1894), and 2: 642, 667, 1121, & 1213—1214. 1895; Perkin, Journ. Chem. Soc. 73: 1019. 1898; Gürke, Notizbl. Bot. Gart. Berl. 3: 77. 1900; Durand & Jacks., Ind. Kew. Suppl. 1, pr. 1, 449 & 457. 1906; Prain, Ind. Kew. Suppl. 3: 189. 1908; Huber, Bol. Mus. Goeldi 5: 209—222, pl. 1—4. 1908; Engl. in Engl. & Drude, Veget. Erde 9 (1, 1): 295, fig. 261. 1910; Craib, Contrib. Fl. Siam Dicot. 164—165. 1912; J. Matsum., Ind. Pl. Jap. 2 (2): 534. 1912; F. M. Bailey, Compreh. Cat. Queensl. Pl. 384 & 386, fig. 362. 1913; Prain, Ind. Kew. Suppl. 4, pr. 1, 248. 1913; Pittier, Contrib. U. S. Nat. Herb. 18: 171. 1916; Bose, Man. Ind. Bot. 131 & 252. 1920; Prain, Ind. Kew. Suppl. 5, pr. 1, 272—273. 1921; F. Miranda, Indiana For. 48: 596. 1922; Haines, Bot. Bihar & Orissa 4: 710—713. 1922; H. J. Lam, Bull. Jard. Bot. Buitenz., ser. 3, 5: 175—178. 1922; H. J. Lam in Bakh. & Lam, Nov. Guinea 14, Bot. 1: 169. 1924; Gamble, Fl. Presid. Madras 6: 1086 & 1101—1103. 1924; H. F. MacMillan, Trop. Plant. & Gard., ed. 1, 207, 217, 219, 380, & 592. 1925; A. W. Hill, Ind. Kew. Suppl. 6: 219.

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 ["142"]: 1—91, pl. 1—13. 1928; A. W. Hill, Ind. Kew. Suppl. 7:
 56 & 252. 1929; Pieper in Fedde, Repert. Spec. Nov. 26: 161—166.
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 P'ei, Sinensia 2: 70—74, fig. 1 & 2. 1932; E. T. Ellis, Gard.
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 1933; Clute, Amer. Bot. 41: 70—71. 1935; H. F. MacMillan, Trop.
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 F. MacMillan, Trop. Plant. & Gard., ed. 5, pr. 1, 197, 214, 217,
 366, & 558. 1943; N. K. Basu, Indian Journ. Pharm. 6: 71—73.
 1944; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 2, 1: 59, 77,
 297, 304, 447, 529, 582, 619, & 844 (1946) and 2: 83, 642, 667,
 1121, & 1213—1214. 1946; J. Hutchinson, Botanist in South. Afr.
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 Trop. Plant. & Gard., ed. 5, pr. 2, 197, 214, 217, 366, & 558.
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 Prain, Ind. Kew. Suppl. 4, pr. 2, 248. 1958; Anon., U. S. Dept.
 Agr. Bot. Subj. Index 15: 14354, 14360, & 14362. 1958; Karrer,
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 Anon., Biol. Abstr. 30: 4370. 1958; Shantz & Turner, Photog.
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 Ind. Kew. Suppl. 12: 151. 1959; Cambie, N. Zeal. Journ. Sci.
 Technol. 2: 230. 1959; Seikel, Holder, & Birzgalis, Arch. Bio-
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 ed., 329—330. 1960; Moldenke, Phytologia 8: 64. 1961; Sebastine
 & Henry, Bull. Bot. Surv. India 3: 61. 1961; Nair & Rehman, Bull.
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 69: 57. 1962; White, Forest Fl. North Rhodesia 455. 1962; Men-
 ninger, Flow. Trees World 18—19, 284, 314, 315, 319—321, 327,
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 Runeckles, Proc. Sympos. Pl. Phenol. Group 31. 1963; Jain, Bull.
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1963; S. V. Ramaswamy, Bull. Bot. Surv. India 6: 10 & 17. 1964; Vyas, Journ. Indian Bot. Soc. 43: 325 (1964) and 44: 154, 160, & 310. 1965; Backer & Bakh., Fl. Java 2: 595, 604, & 605. 1965; Arora & Aggarwal, Journ. Indian Bot. Soc. 44: 317 & 325. 1965; Gómez Pompa, Bol. Soc. Bot. Mex. 29: 94. 1965; Neal, In Gard. Hawaii, new rev. ed., 720, 721, & 729. 1965; N. Taylor, Guide Gard. Shrubs & Trees 325, opp. 327, fig. 5, & 432. 1965; Teague, Anal. Mus. Hist. Nat. Montev., ser. 2, 7 (4): 45. 1965; Datta, Handb. Syst. Bot. 183, 339, 397, & 434. 1965; Humbert, Trav. Sect. Scient. & Tech. Inst. Franç. Pond. Hors ser. 6: 60 & 65. 1965; Gaussen & al., Trav. Sect. Scient. & Tech. Inst. Franç. Pond. Hors ser. 7: 49, 50, 59, 71, & 104 (1966) and 8: 57 & 64. 1966; Airy-Shaw in Willis, Dict. Flow. Pl., ed. 7, 32, 40, 205, 245, 408, 409, 654, 687, 770, 932, 944, 1148, 1173, 1184, & 1188. 1966; Guest, Fl. Iraq 1: 84 & 106. 1966; Bowman, Galap. 228 & 317. 1966; Arora, Journ. Indian Bot. Soc. 45: 133 & 135. 1966; Moldenke, Phytologia 15: 73—113. 1967; Anon., Biol. Abstr. 48: S.172. 1967.

It is perhaps worth noting here that Ephielis Schreb. is a synonym of Ratonia DC. in the Sapindaceae, while Wallrothia Spreng. is Seseli L. in the Ammiaceae. Willis (1958) places the genus Macrostegia Nees in the Acanthaceae.

Additional excluded species are

Vitex adulterina Hausskn. = Verbena adulterina Hausskn.

Vitex formosana Hemsl. = Vitis formosana Hemsl., Vitaceae

Vitex pinnata Burm. f. = Aglaia odorata Lour., Meliaceae

Vitex zeylanica Burm. f. = Stereospermum sp., Bignoniaceae

The Boissier (1879) reference cited above is sometimes cited as "1875", but actually only pages 1 to 280 were issued in that year; pages 281 to 1276 first appeared in print in the year 1879. The Glaziou 3809, distributed as a Vitex sp., is actually Clerodendrum viscosum Vent.

Further excluded species are

Vitex dalrympleana F. Muell. = Gmelina dalrympleana (F. Muell.)
H. J. Lam

Vitex involucratus Presl = Sphenodesme involucrata (Presl) B. L.
Robinson

VITEX ACUMINATA R. Br.

Additional bibliography: Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 2: 1213 & 1214. 1895; F. M. Bailey, Compreh. Cat. Queensl. Pl. 384 & 386, fig. 362. 1913; Stapf, Ind. Lond. 6: 478. 1931; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 2, 2: 1213 & 1214 (1946) and pr. 3, 2: 1213 & 1214. 1960; R. E. Harrison, Handb. Trees & Shrubs, rev. ed., 330. 1960; Moldenke, Phytologia 15: 79. 1967.

VITEX AGELAEIFOLIA Mildbr.

Synonymy: Vitex aglaeifolia Mildbr. ex Moldenke, Phytologia 15: 79, sphalm. 1967.

Additional bibliography: A. W. Hill, Ind. Kew. Suppl. 7: 252 (1929) and 8: 249. 1933; Moldenke, Phytologia 15: 79. 1967.

VITEX AGELAEIFOLIA var. RUFULA Moldenke

Synonymy: Vitex aglaeifolia var. rufula Moldenke, Phytologia 15: 79, sphalm. 1967.

Additional bibliography: Moldenke, Phytologia 15: 79. 1967.

VITEX AGNUS-CASTUS L.

Additional & emended bibliography: Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 2: 1213 & 1214. 1895; Clute, Amer. Bot. 41: 70-71. 1935; Worsdell, Ind. Lond. Suppl. 2: 500. 1941; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 2, 2: 1213 & 1214. 1946; Anon., U. S. Dept. Agr. Bot. Subj. Index 15: 14362. 1958; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 3, 2: 1213 & 1214. 1960; R. E. Harrison, Handb. Trees & Shrubs, rev. ed., 329--330. 1960; N. Taylor, Guide Gard. Shrubs & Trees 325 & opp. 327, fig. 5. 1965; Guest, Fl. Iraq 1: 84 & 106. 1966; Moldenke, Phytologia 15: 79--87. 1967.

Additional illustrations: R. E. Harrison, Handb. Trees & Shrubs, rev. ed., 329. 1960; N. Taylor, Guide Gard. Shrubs & Trees opp. 327, fig. 5 [in color]. 1965.

Guest (1966) reports that this species comprises 10--20 percent of the *Asphodelatum aestivus* association and 50--60 percent of the steppe association in Iraq. Taylor (1965) tells us that the corollas have one lobe larger than the others and that the species is hardy from Life Zone 5 southward in the United States, otherwise it winterkills and then grows back. The Boissier (1879) reference to this species is sometimes cited as "1875", but the page involved was not actually issued until the year 1879.

VITEX AGNUS-CASTUS f. ALBA (West.) Rehd.

Additional bibliography: N. Taylor, Guide Gard. Shrubs & Trees 325. 1965; Moldenke, Phytologia 15: 84. 1967.

VITEX AGNUS-CASTUS var. CAERULEA Rehd.

Additional bibliography: Moldenke, Phytologia 15: 82 & 84--85. 1967.

VITEX AGNUS-CASTUS var. DIVERSIFOLIA (Carr.) Schelle

Additional bibliography: Moldenke, Phytologia 15: 85 & 87. 1967.

VITEX AGNUS-CASTUS f. LATIFOLIA (Mill.) Rehd.

Additional bibliography: Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 2: 1214 (1895), and pr. 2, 2: 1214 (1946), and pr. 3, 1214. 1960; N. Taylor, Guide Gard. Shrubs & Trees 325. 1965; Moldenke, Phytologia 15: 79, 82, & 84--86. 1967.

Taylor (1965) says that this form has larger leaves and deeper-colored flowers, is the most widely cultivated form growing in ordinary garden soil, and that north of Life Zone 5 in the U.S.A. it

should be cut back in the autumn and mulched.

VITEX AGNUS-CASTUS var. PSEUDO-NEGUNDO Hausskn.

Additional synonymy: Vitex negundo var. pseudo-negundo Hausskn. ex Galil, Eizikowitch, & Prusbul, Ind. Sem. Hort. Bot. Univ. Tel-aviv. 5. 1965. Vitex agnus-castus var. pseudonegundo Hausskn. ex Guest, Fl. Iraq 1: 84. 1966.

Additional bibliography: Prain, Ind. Kew. Suppl. 5, pr. 1, 273. 1921; E. J. Salisb., Ind. Kew. Suppl. 11: 265. 1953; Prain, Ind. Kew. Suppl. 5, pr. 2, 273. 1960; Guest, Fl. Iraq 1: 84. 1966; Moldenke, Phytologia 15: 79 & 86—87. 1967.

VITEX AJUGAEFLORA Dop

Additional & emended bibliography: A. W. Hill, Ind. Kew. Suppl. 9: 297. 1938; Moldenke, Phytologia 8: 27. 1961.

VITEX ALTISSIMA L.f.

Additional & emended bibliography: Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 2: 1213 & 1214. 1895; E. D. Merr., Philip. Journ. Sci. 19: 331. 1921; Gamble, Fl. Presid. Madras 6: 1102—1103. 1924; H. F. MacMillan, Trop. Plant. & Gard., ed. 1, 207, 217, 219, & 592. 1925; Stapf, Ind. Lond. 6: 478 & 479. 1931; H. F. MacMillan, Trop. Plant. & Gard., ed. 4, 197, 214, 217, & 558 (1935) and ed. 5, pr. 1, 197, 214, 217, & 558. 1943; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 2, 2: 1213 & 1214. 1946; H. F. MacMillan, Trop. Plant. & Gard., ed. 5, pr. 2, 197, 214, 217, & 558. 1948; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 3, 2: 1213 & 1214. 1960; Arora, Journ. Indian Bot. Soc. 45: 133 & 135. 1966; Gaussen & al., Trav. Sect. Scient. & Tech. Inst. Franç. Pond. Hors ser. 7: 49, 59, & 104. 1966; Moldenke, Phytologia 15: 87—89. 1967.

Arora (1966) refers to this plant as a large tree, with an average height of 10 meters, common in the second story of the semi-evergreen forest. Merrill (1921) is of the opinion that the Vitex pinnata of Linnaeus belongs in the synonymy of V. altissima, but I regard it as the proper designation for what used to be called V. pubescens Vahl.

VITEX ALTISSIMA f. SUBGLABRA Thwaites, Enum. Fl. Zeyl. 244. 1864.

Synonymy: Vitex zeylanica Turcz., Bull. Soc. Imp. Nat. Mosc. 36 (2): 223. 1863 [not V. zeylanica Burm. f., Fl. Ind. 138. 1768]. Vitex altissima var. zeylanica (Turcz.) C. B. Clarke in Hook. f., Fl. Brit. Ind. 4: 584. 1885.

Bibliography: Burm. f., Fl. Ind. 138. 1768; Turcz., Bull. Soc. Imp. Nat. Mosc. 36 (2): 223. 1863; Thwaites, Enum. Fl. Zeyl. 244. 1864; C. B. Clarke in Hook. f., Fl. Brit. Ind. 4: 584. 1885; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 2: 1214. 1895; Journ. Agr. Univ. Porto Rico 20: 133 & 626. 1936; Moldenke, Geogr. Distrib. Avicenn. 40. 1939; Moldenke, Prelim. Alph. List Invalid Names 49 & 52. 1940; Moldenke, Alph. List Invalid Names 52 & 56. 1942; Moldenke, Geogr. Distrib. Verbenac., ed. 1, 56, 75, & 102.

1942; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 2, 2: 1214.
1946; Moldenke, Known Geogr. Distrib. Verbenac., ed. 2, 130, 165,
& 200. 1949; Moldenke, Phytologia 5: 202—203. 1955; Moldenke,
Résumé 167, 225, 380, 391, & 475. 1959; Jacks. in Hook. f. &
Jacks., Ind. Kew., pr. 3, 2: 1214. 1960; Moldenke, Phytologia 15:
88—89. 1967.

The Vitex zeylanica Burm. f. (1768), according to Jackson
(1895), is probably a species of Stereospermum in the Bignonia-
ceae. Under the present edition of the International Rules of
Botanical Nomenclature, however, Burman's binomial invalidates
the later homonymous V. zeylanica of Turczaninow (1863) and ren-
ders the epithet "zeylanica" unavailable for the present taxon,
which, therefore, needs a new designation.

VITEX ALTISSIMA var. ZEYLANICA (Turcz.) C. B. Clarke

This trinomial is invalid and must be replaced by V. altissima
f. subglabra Thwaites, as explained above.

VITEX ALTMANNI Moldenke

Additional bibliography: G. Taylor, Ind. Kew. Suppl. 12: 151.
1959; Moldenke, Phytologia 8: 28. 1961.

VITEX AMANIENSIS Pieper

Additional & emended bibliography: A. W. Hill, Ind. Kew. Suppl.
8: 249. 1933; Moldenke, Phytologia 8: 28. 1961.

VITEX AMBONIENSIS Gürke

Additional bibliography: Thiselt.-Dyer, Ind. Kew. Suppl. 2:
194. 1904; Durand & Jacks., Ind. Kew. Suppl. 1, pr. 1, 457 (1906)
and pr. 2, 457. 1941; J. Hutchinson, Botanist in South. Afr. 464.
1946; Durand & Jacks., Ind. Kew. Suppl. 1, pr. 3, 457. 1959; Mol-
denke, Phytologia 15: 89. 1967.

Hutchinson (1946) describes this plant as a shrub, the leaves
digitately 5-foliolate, the leaflets broadly oblanceolate, softly
pubescent beneath, and the fruits plum-colored, borne on a plate-
like fruiting-calyx, and cites his no. 3304.

VITEX ANGOLENSIS Gürke

Additional bibliography: Durand & Jacks., Ind. Kew. Suppl. 1,
pr. 1, 457 (1906), pr. 2, 457 (1941), and pr. 3, 457. 1959; Molden-
ke, Phytologia 15: 89. 1967.

VITEX APPUNI Moldenke

Additional bibliography: E. J. Salisb., Ind. Kew. Suppl. 11:
265. 1953; Moldenke, Phytologia 15: 89. 1967.

VITEX AUREA Moldenke

Additional bibliography: G. Taylor, Ind. Kew. Suppl. 12: 151.
1959; Moldenke, Phytologia 15: 90. 1967.

VITEX AXILLARIS Wall.

Additional bibliography: Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 2: 1213 (1895), pr. 2, 2: 1213 (1946), and pr. 3, 2: 1213. 1960; Moldenke, Phytologia 15: 90. 1967.

VITEX BALBI Chiov.

Additional bibliography: A. W. Hill, Ind. Kew. Suppl. 9: 297. 1938; Moldenke, Phytologia 15: 90. 1967.

VITEX BARBATA Planch.

Additional synonymy: *Vitex barbata* "Planch. ex Baker" apud Worsdell, Ind. Lond. Suppl. 2: 500. 1941.

Additional bibliography: Thiselet.-Dyer, Ind. Kew. Suppl. 2: 193. 1904; Hutchinson & Dalz., Fl. W. Trop. Afr., ed. 1, 2: 276. 1937; Aubrév., Fl. Forest. Soudano-Guin. 504 & 507, pl. 115 (4). 1950; Berhaut, Fl. Sénégal 21. 1954; Moldenke, Phytologia 15: 90 & 95. 1967.

Additional illustrations: Aubrév., Fl. Forest. Soudano-Guin. pl. 115 (4). 1950.

VITEX BEFOTAKENSIS Moldenke

Additional bibliography: G. Taylor, Ind. Kew. Suppl. 12: 151. 1959; Moldenke, Phytologia 15: 90. 1967.

VITEX BENTHAMIANA Domin

Additional bibliography: A. W. Hill, Ind. Kew. Suppl. 8: 249. 1933; Moldenke, Phytologia 15: 90. 1967.

VITEX BENUENSIS Engl.

Additional & emended bibliography: A. W. Hill, Ind. Kew. Suppl. 8: 249. 1933; Moldenke, Phytologia 15: 90. 1967.

VITEX BEQUAERTI DeWild.

Additional bibliography: Prain, Ind. Kew. Suppl. 5, pr. 1, 272 (1921) and pr. 2, 272. 1960; Moldenke, Phytologia 15: 90. 1967.

VITEX BERAVIENSIS Vatke

Additional bibliography: Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 2: 1213. 1895; A. W. Hill, Ind. Kew. Suppl. 7: 252. 1929; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 2, 2: 1213. 1946; Anon., U. S. Dept. Agr. Bot. Subj. Index 15: 14361. 1958; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 3, 2: 1213. 1960; Moldenke, Phytologia 15: 90--91. 1967.

VITEX BETSILIENSIS Humbert

Additional bibliography: Hill & Salisb., Ind. Kew. Suppl. 10: 244. 1947; Moldenke, Phytologia 15: 91. 1967.

VITEX BOGALENSIS Wernham

Additional bibliography: Prain, Ind. Kew. Suppl. 5, pr. 1, 272 (1921) and pr. 2, 272. 1960; Moldenke, Phytologia 15: 91. 1967.

VITEX BOJERI Schau.

Additional & emended synonymy: Vitex ferruginea Bojer ex Schau. in A. DC., Prodr. 11: 694, in syn. 1847 [not V. ferruginea Baker, 1900, nor Schum., 1902, nor Schum. & Thonn., 1827, nor Vahl, 1818]. Vitex bojeri "Schau. in DC." apud Worsdell, Ind. Lond. Suppl. 2: 500. 1941.

Additional bibliography: S. Elliot, Ann. Bot. 5: 376, pl. 22, fig. 119. 1891; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 2: 1213. 1895; Stapf, Ind. Lond. 6: 478. 1931; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 2, 2: 1213 (1946) and pr. 3, 2: 1213. 1960; Moldenke, Phytologia 15: 92. 1967.

Additional illustrations: S. Elliot, Ann. Bot. 5: pl. 22, fig. 119. 1891.

VITEX BRACTEATA S. Elliot, Journ. Linn. Soc. Lond. 29: 42. 1891
[not V. bracteata Horsf., 1858].

Additional bibliography: Durand & Jacks., Ind. Kew. Suppl. 1, pr. 1, 457 (1906), pr. 2, 457 (1941), and pr. 3, 457. 1959; Moldenke, Phytologia 15: 92. 1967.

Vitex bracteata Horsf. belongs in the synonymy of V. pinnata L. It was never validly published under the tenets of the present International Rules of Botanical Nomenclature, so does not preclude the use of the specific epithet for the present taxon.

VITEX BREVILABIATA Ducke

Additional bibliography: A. W. Hill, Ind. Kew. Suppl. 7: 252. 1929; Moldenke, Phytologia 15: 92. 1967.

VITEX BREVIPETIOLATA Moldenke

Additional bibliography: Hill & Salisb., Ind. Kew. Suppl. 10: 244. 1947; Moldenke, Phytologia 15: 92. 1967.

VITEX BUCHANANII J. G. Baker

Emended synonymy: Vitex buchanani Baker ex Durand & Jacks., Ind. Kew. Suppl. 1, pr. 1, 457. 1906.

Additional bibliography: Durand & Jacks., Ind. Kew. Suppl. 1, pr. 1, 457 (1906), pr. 2, 457 (1941), and pr. 3, 457. 1959; Moldenke, Phytologia 15: 92. 1967.

VITEX BUCHANANII var. QUADRANGULA (Gürke) Pieper

Additional bibliography: Thiselet.-Dyer, Ind. Kew. Suppl. 2: 194. 1904; Moldenke, Phytologia 15: 92. 1967.

VITEX BUCHNERI Gürke

Additional bibliography: Durand & Jacks., Ind. Kew. Suppl. 1, pr. 1, 457 (1906), pr. 2, 457 (1941), and pr. 3, 457. 1959; Moldenke, Phytologia 15: 93 & 99. 1967.

VITEX BUDDINGII Moldenke

Additional bibliography: G. Taylor, Ind. Kew. Suppl. 12: 151. 1959; Moldenke, Phytologia 15: 93. 1967.

VITEX CAESPITOSA Exell

Additional bibliography: A. W. Hill, Ind. Kew. Suppl. 9: 297. 1938; Moldenke, Phytologia 15: 93. 1967.

VITEX CALOTHYRSA Sandw.

Additional bibliography: A. W. Hill, Ind. Kew. Suppl. 8: 249. 1933; Moldenke, Phytologia 15: 93. 1967.

VITEX CANESCENS Kurz

Additional bibliography: Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 2: 1213. 1895; Craib, Contrib. Fl. Siam Dicot. 164. 1912; Ptei, Sinensia 2: 70 & 73. 1932; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 2, 2: 1213 (1946) and pr. 3, 2: 1213. 1960; Moldenke, Phytologia 15: 93. 1967.

VITEX CAPITATA Vahl

Additional synonymy: Vitex brasiliensis Juss. ex Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 2: 1213. 1895.

Additional & emended bibliography: Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 2: 1213. 1895; Stapf, Ind. Lond. 6: 478. 1931; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 2, 2: 1213. 1946; Romero Castañeda, Caldasia 7: 49. 1955; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 3, 2: 1213. 1960; Moldenke, Phytologia 15: 93—94. 1967.

Additional citations: SURINAM: Irwin, Prance, Söderstrom, & Holmgren 55514 (E, F, K, N, N, N, N, Su, Ut, W).

VITEX CARBUNCULORUM Smith & Ramas

Additional bibliography: Prain, Ind. Kew. Suppl. 5, pr. 1, 272 (1921) and pr. 2, 272. 1960; Moldenke, Phytologia 15: 94. 1967.

VITEX CARVALHI Gürke

Additional bibliography: Durand & Jacks., Ind. Kew. Suppl. 1, pr. 1, 457 (1906), pr. 2, 457 (1941), and pr. 3, 457. 1959; Moldenke, Phytologia 15: 94. 1967.

VITEX CAULIFLORA Moldenke

Additional bibliography: G. Taylor, Ind. Kew. Suppl. 12: 151. 1959; Moldenke, Phytologia 15: 94—95. 1967.

VITEX CESTROIDES J. G. Baker

Additional bibliography: Durand & Jacks., Ind. Kew. Suppl. 1, pr. 1, 457 (1906), pr. 2, 457 (1941), and pr. 3, 457. 1959; Moldenke, Phytologia 15: 95. 1967.

VITEX CHARIENSIS A. Chev.

Additional bibliography: Prain, Ind. Kew. Suppl. 5, pr. 1, 272 (1921) and pr. 2, 272. 1960; Moldenke, Phytologia 15: 95. 1967.

VITEX CHRYSLERIANA Moldenke

Additional bibliography: Hill & Salisb., Ind. Kew. Suppl. 10:

244. 1947; Moldenke, *Phytologia* 15: 95. 1967.

VITEX CHRYSOCARPA Planch.

Additional bibliography: Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 2: 1213. 1895; A. W. Hill, Ind. Kew. Suppl. 8: 249. 1933; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 2, 2: 1213. (1946) and pr. 3, 2: 1213. 1960; Moldenke, *Phytologia* 15: 90 & 95—96. 1967.

VITEX CHRYSOMALLUM Steud.

Additional & emended bibliography: Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 1: 529 (1893), 2: 1213 & 1214 (1895), and pr. 2, 1: 529 (1946) and 2: 1213 & 1214. 1946; Moldenke in Humbert, Fl. Madag. 174: 76, 77, 135—139, & 271—273, fig. 21 (6). 1956; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 3, 1: 529 (1960) and 2: 1213 & 1214. 1960; Moldenke, *Phytologia* 15: 96. 1967.

VITEX CILIATA Pierre

Additional & emended bibliography: A. W. Hill, Ind. Kew. Suppl. 8: 249. 1933; Moldenke, *Phytologia* 8: 32. 1961.

VITEX CILIO-FOLIOLATA A. Chev.

Additional & emended bibliography: A. W. Hill, Ind. Kew. Suppl. 6: 219 (1926) and 9: 297. 1938; Moldenke, *Phytologia* 15: 96. 1967.

Hill (1938) reduces this species to synonymy under V. rivularis Gürke.

VITEX CLEMENTIS Britton & P. Wils.

Additional bibliography: A. W. Hill, Ind. Kew. Suppl. 6: 219. 1926; Moldenke, *Phytologia* 8: 32. 1961.

VITEX COCHINCHINENSIS Dop

Additional bibliography: A. W. Hill, Ind. Kew. Suppl. 9: 297. 1938; Moldenke, *Phytologia* 15: 96—97. 1967.

Illustrations: Dop, Trav. Lab. For. Toulouse 1 (1): pl. 3. 1928.

VITEX COFASSUS Reinw.

Additional synonymy: Vitex monophylla K. Schum. apud Durand & Jacks., Ind. Kew. Suppl. 1, pr. 1, 457. 1906.

Additional & emended bibliography: Rumph., Herb. Amboin. 3: 28, pl. 14, fig. B. 1743; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 2: 1213 & 1214. 1895; Durand & Jacks., Ind. Kew. Suppl. 1, pr. 1, 457. 1906; Stapf, Ind. Lond. 6: 478. 1931; Durand & Jacks., Ind. Kew. Suppl. 1, pr. 2, 457. 1941; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 2, 2: 1213 & 1214. 1946; Durand & Jacks., Ind. Kew. Suppl. 1, pr. 3, 457. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 3, 2: 1213 & 1214. 1960; Moldenke, *Phytologia* 15: 77 & 97—98. 1967.

Additional illustrations: Rumph., Herb. Amboin. 3: pl. 14, fig.

B. 1743.

VITEX COLUMBIENSIS Pittier

Additional & emended bibliography: A. W. Hill, Ind. Kew. Suppl. 7: 252. 1929; Romero Castañeda, Caldasia 7: 49—50. 1955; J. A. Peters, Biol. Abstr. 30: 1703. 1956; Anon., Biol. Abstr. 30: 4370. 1958; G. Taylor, Ind. Kew. Suppl. 12: 151. 1959; Moldenke, Phytologia 15: 98. 1967.

VITEX COMPRESSA Turcz.

Additional & emended bibliography: Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 2: 1213. 1895; A. W. Hill, Ind. Kew. Suppl. 7: 252. 1929; Moldenke, Torreya 33: 67—69. 1933; A. W. Hill, Ind. Kew. Suppl. 9: 297. 1938; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 2, 2: 1213. 1946; Romero Castañeda, Caldasia 7: 49. 1955; Anon., U. S. Dept. Agr. Bot. Subj. Index 15: 14362. 1958; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 3, 2: 1213. 1960; Moldenke, Phytologia 15: 98—99. 1967.

The H. Pittier 15118, cited by me in Phytologia 15: 97 (1967) as from "State undetermined", is actually from Anzoategui, Venezuela.

VITEX CONGENSIS A. Chev.

Additional bibliography: A. W. Hill, Ind. Kew. Suppl. 6: 219. 1926; Moldenke, Phytologia 15: 99. 1967.

VITEX CONGESTA Oliv.

Emended synonymy: Varangevillea hispidissima Ball. apud Durand & Jacks., Ind. Kew. Suppl. 1, pr. 1, 449, sphalm. 1906.

Additional & emended bibliography: Durand & Jacks., Ind. Kew. Suppl. 1, pr. 1, 449 & 457. 1906; Stapf, Ind. Lond. 6: 478. 1931; Durand & Jacks., Ind. Kew. Suppl. 1, pr. 2, 449 & 457 (1941) and pr. 3, 449 & 457. 1959; Moldenke, Phytologia 15: 99. 1967.

VITEX CONGOLENSIS DeWild. & Th. Dur.

Additional bibliography: Thistel.-Dyer, Ind. Kew. Suppl. 2: 193 & 194. 1904; Moldenke, Phytologia 15: 93, 99—100, & 109. 1967.

VITEX CONGOLENSIS var. GILLETII (Gürke) Pieper

Additional bibliography: Prain, Ind. Kew. Suppl. 3: 189. 1908; Moldenke, Phytologia 15: 100. 1967.

VITEX COOPERI Standl.

Additional bibliography: A. W. Hill, Ind. Kew. Suppl. 8: 249. 1933; Moldenke, Phytologia 8: 34—35. 1961.

VITEX CORDATA Aubrév.

Additional bibliography: E. J. Salisb., Ind. Kew. Suppl. 11: 265. 1953; Moldenke, Phytologia 15: 100. 1967.

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T

A REDEFINITION OF PENSTEMON ARKANSANUS PENNELL
(SCROPHULARIACEAE)

Aileen L. McWilliam
711 Magnolia Avenue, Mena, Arkansas

The descriptions and placements of Penstemon arkan-
sanus Pennell by various taxonomists have in some
cases digressed from the taxon originally described
by Dr. Francis Pennell. In attempting to define and
limit the Oklahoma and Arkansas representatives of
the Series Graciles of the genus Penstemon the author
finds it advisable to redefine P. arkansanus in Dr.
Pennell's original sense and as the plant actually
occurs as a distinct taxon in its habitat in eastern
Oklahoma and western to central Arkansas.

PENSTEMON ARKANSANUS Pennell, Proc. Acad. Nat. Sci.
Phila. 73:493. 1922.

P. pallidus subsp. arkansanus (Pennell) Bennett,
Phytol. 9:57. 1963.

P. multicaulis Pennell, Proc. Acad. Nat. Sci. Phila.
73:494. 1922.

P. wherryi Pennell, Monogr. Acad. Nat. Sci. Phila.
1:228. 1935.

P. pallidus sensu Gleason (as to P. arkansanus
only, in synonym.), New Ill. Flora ... etc. 3:224.
1952.

P. australis subsp. laxiflorus (Pennell) Bennett
(as to P. wherryi only, in synonym.), Phytol.
9:58. 1963.

Stems one to many, 2.5-6 dm, gray-puberulent, usually
purplish; basal leaves obovate, petioled, purple on
the lower surface, middle cauline leaves up to 80 mm
long, averaging six times as long as wide, elliptic-
lanceolate, essentially glabrous, with slight pubes-
cence on midrib and main veins, dark olive green, mi-
nutely serrate-denticulate or entire, ascending; in-
florescence glandular pubescent, of three to five
fascicles, lateral branches well-developed, usually
diverging arcuately from the principal axis, re-
branching cymosely three or more times, many-flowered,
bracts much reduced, subulate; sepals puberulent,
2-4 mm long, ovate, acute, scarious-margined; corolla
pale violet or white, 15-18 mm long, tube and throat
subequal, throat expanded, orifice wide open, the
upper lobes upcurved, the lower spreading, flabelli-
form, throat with fine violet lines within, staminode
barely exerted, heavily bearded with yellow hairs.

Flowering April, May on shaley outcrops near edge of woods and on exposed shale and clay roadside cuts and banks.

P. arkansanus is distinguished from P. pallidus by corolla form, P. pallidus having a tube to throat length ratio of 1:2 rather than subequal, the throat scarcely expanded, and the lower lip narrow and forward thrust; by leaf form, P. pallidus having leaves averaging only four times as long as wide; and by pubescence, P. pallidus having leaves puberulent to velvety pubescent or hirsute, and stems usually hirsute.

P. arkansanus is distinguished from P. laxiflorus by corolla form, P. laxiflorus having a tube to throat length ratio of 1:2, with the orifice partly closed by the uparching, strongly grooved lower lip. The cauline leaves of P. laxiflorus are usually divergent from the stem rather than ascending. P. laxiflorus grows in sandy soil.

McWilliam, in Ark. Acad. Sci. Proc. XXI, 1967, verifies Pennell's acknowledgement by letter to Dr. D.M. Moore that P. multicaulis Pennell and P. wherryi Pennell should be placed in synonymy with P. arkansanus Pennell.

Excluded species: P. arkansanus var. pubescens, acknowledged by Pennell to be the same as P. pallidus Small (Pennell, 1935).

These conclusions are based on extensive field observations in central to western Arkansas and eastern to central Oklahoma, and on examination of specimens in the following herbaria: OKL, UARK, TUL (U. of Tulsa).

Specimens examined: P. arkansanus, ARKANSAS counties (43 collections): Benton, Carroll, Cleburne, Conway, Faulkner, Franklin, Garland, Johnson, Logan, Lonoke, Marion, Montgomery, Newton, Perry, Pike, Polk, Pope, Pulaski, Saline, Scott, Searcy, Sebastian, Sevier, Washington; MISSOURI counties (9 collections): Barry, Stone; OKLAHOMA counties (29 collections): Cherokee, Latimer, LeFlore, McCurtain, Pushmataha.

P. pallidus, ARKANSAS counties (27 collections): Baxter, Boone, Carroll, Fulton, Greene, Independence, IZARD, Lawrence, Searcy, Sharp, Stone, VanBuren; MISSOURI counties (4 collections): Butler, Cooper, St. Louis; KENTUCKY, ILLINOIS, IOWA, NEW HAMPSHIRE, (1 collection each).

P. laxiflorus, ARKANSAS counties (11 collections): Benton, Bradley, Drew, Jefferson, Lincoln, Miller, Nevada, Union; OKLAHOMA counties (68 collections): Adair, Atoka, Bryan, Caddo, Carter, Choctaw, Cleveland, Comanche, Grady, Hughes, LeFlore, Lincoln, Logan, Love, McClain, McCurtain, Marshall, Murray, Okfuskee, Oklahoma, Pittsburg, Pushmataha, Seminole; TEXAS counties (4 collections): Bastrop, Erath, Grayson.

Included in the study were the following sheets determined by Pennell or cited in his Monogr. # 1, Acad. Nat. Sci. Phila. 1935:

P. arkansanus: ARKANSAS, Franklin: Cass, Moore 46072 (UARK); Garland: Hot Springs, Moore 460027 (UARK); Perry: Lake Minrod, Moore 460034 (UARK); Yell: Havana, Moore (UARK) (Isotype of P. wherryi Pennell, cited p. 229); OKLAHOMA, LeFlore: Page, Hopkins 2951 (OIL); Pine Valley, Goodman 2405 (OIL); Stapp, Hopkins & Van Valkenburg 4205 (OIL); Summerfield, Hopkins & Van Valkenburg 4296 (OIL).

P. pallidus: ARKANSAS, Fulton: Mammoth Spring, Pennell 11542 (UARK) (Dupl. cited p. 225); Searcy: Marshall, Moore 470050 (UARK); MISSOURI, Cooper: 30 mi. w of St. Louis, Bush (OIL); St. Louis: Allentown, Pennell 11682 (OIL) (Dupl. cited p. 225).

P. laxiflorus: ARKANSAS, Jefferson: Jefferson Springs, Pennell 10658 (UARK) (Dupl. cited p. 232); OKLAHOMA, Atoka: Atoka, Hopkins 2842 (OIL); Logan: Exp. Station Farm, Goodman 2124 (OIL); McCurtain: 15 mi. nw Broken Bow, Hopkins 2893 (OIL); Idabel, Hopkins 2878 (OIL); Idabel, Houghton 3629 (OIL) (Dupl. cited p. 232); Pittsburg: McAlester, Pennell 10586 (OIL, UARK) (Dupl. cited p. 232).

Research at the University of Oklahoma Biological Station, NSF Grant GW 526 for Research Participation for High School Teachers and Academic Year Extension, supervised by Dr. George J. Goodman, University of Oklahoma, and Dr. Harriet E. Barclay, University of Tulsa.

ADDITIONAL NOTES ON THE GENUS PETITIA. II

Harold N. Moldenke

PETITIA Jacq.

Additional & emended bibliography: A. L. Juss., Gen. Pl., ed. 1, 107 (1789) and ed. 2, 120. 1791; Bocq., Adansonia 2: 84, 90, 97, 111, 118, 119, 121, 124, 142, 145, 147, 149, 151, & 160 (1862) and 3: 178, 180, 183, 185, & 193—194, pl. 9, fig. 15—25. 1863; Bocq., Rev. Verbenac. 84. 90, 97, 111, 118, 119, 121, 124, 142, 145, 147, 149, 151, 160, 178, 180, 183, 185, 193—194, & 264, pl. 9, fig. 15—25. 1863; Turcz., Bull. Soc. Imp. Nat. Mosc. 36 (2): 219—220. 1863; Griseb., Cat. Pl. Cub. 216. 1866; A. S. Hitchc., Ann. Rep. Mo. Bot. Gard. 4: 118. 1893; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 1: 46 & 386. 1893; P. C. Standl., Contrib. U. S. Nat. Herb. 23: 1235 & 1252. 1924; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 2, 1: 46 & 386. 1946; Moldenke, Alph. List Cit. 1: 2, 6, 7, 11, 39, 40, 43, 55—57, 60—67, 74, 89, 99, 112, 114, 120, 123, 129, 130, 135, 138, 162, 179, 183—186, 188, 189, 195—197, 207, 208, 211, 216, 221, 244, 258, 259, 270, 272, 273, 275, 277, 301—309, 311, 312, 314, 315, 317, & 323. 1946; Asprey & Robbins, Ecol. Monog. 23: 366. 1953; Angely, Cat. Estat. Gen. Bot. Fan. 17: 5. 1956; Moldenke, Inform. Mold. Set 51 Spec. 3. 1956; Moldenke, Am. Midl. Nat. 59: 334. 1958; Anon., U. S. Dept. Agr. Bot. Subj. Index 15: 14358. 1958; Moldenke, Phytologia 6: 232, 242, 252, & 254—256 (1958) and 6: 511. 1959; J. Hutchinson, Fam. Flow. Pl., ed. 2, 2: 395. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 3, 1: 46 & 386. 1960; Moldenke, Phytologia 7: 399—405 & 498. 1961; Runner, Rep. G. W. Groff Coll. 362. 1961; Moldenke, Biol. Abstr. 36: 3141 (1961) and 37: 215. 1962; Hocking, Excerpt. Bot. A6: 533. 1963; Langman, Select. Guide Lit. Flow. Pl. Mex. 515 & 1010. 1964; Little & Wadsworth, U. S. Dept. Agr. Agric. Handb. 249: 482—483, fig. 228. 1964; Gooding, Loveless, & Proctor, Fl. Barbados 364 & 480. 1965; Moldenke, Phytologia 12: 6 (1965), 13: 318 (1966), and 14: 151. 1966; Jiménez, Supl. Cat. Fl. Doming. 1: 217—218. 1966; Moldenke, Résumé Suppl. 15: 15 & 21. 1967.

PETITIA DOMINGENSIS Jacq.

Additional synonymy: Petitia domingensis Urb. ex Moldenke, Résumé Suppl. 15: 21, in syn. 1967.

Additional & emended bibliography: Bocq., Adansonia 3: [Rev. Verbenac.] 194, pl. 9, fig. 15—25. 1863; Griseb., Cat. Pl. Cub. 216. 1866; A. S. Hitchc., Ann. Rep. Mo. Bot. Gard. 4: 118. 1893; Moldenke, Alph. List Cit. 1: 244. 1946; Asprey & Robbins, Ecol. Monog. 23: 366. 1953; Moldenke, Am. Midl. Nat. 59: 334. 1958; Moldenke, Phytologia 6: 252 & 254—256. 1958; J. Hutchinson, Fam. Flow. Pl., ed. 2, 2: 395. 1959; Moldenke, Biol. Abstr. 37: 215. 1962; Little & Wadsworth, U. S. Dept. Agr. Agric. Handb. 249:

482--483, fig. 228. 1964; Gooding, Loveless, & Proctor, Fl. Barbados 364 & 480. 1965; Moldenke, Phytologia 13: 318 (1966) and 14: 151. 1966; Moldenke, Résumé Suppl. 15: 15 & 21. 1967.

Additional & amended illustrations: Bocq., Adansonia 3: [Rev. Verbenac.] pl. 9, fig. 15--25. 1863; Little & Wadsworth, U. S. Dept. Agr. Agric. Handb. 249: fig. 228. 1964.

Recent collectors have found this plant growing in thickets and on serpentine barrens and on dry limestone hillsides, in forests on mountainsides, and along roadsides in forests, at altitudes of 100 to 3050 feet, fruiting in June and July. Webster calls it a "common tree" in the scrub forest on dogtooth limestone in Jamaica, while Crosby, Hespenheide, & Anderson call it "rare" in sandy roadside soil on Grand Cayman.

Collectors describe it as a shrub, large shrub, or small tree, 2.8--15 meters tall, much-branched, with deciduous leaves, the calyx green, filaments and style white, and anthers dark-brown or black. The corolla is described as "whitish" on G. L. Webster 5115, "white" on B. Augusto 594, Crosby, Hespenheide, & Anderson 40, "greenish" on B. Augusto 1624 & 1690, and "white with greenish-yellow lobes" on Crosby & Anderson 1118. The vernacular names, "capa prieto" and "guazo", are recorded for it. The specific name is often uppercased. Material has been misidentified and distributed in herbaria under the names Aegyphila sp., Beureria succulenta, and Ehretia bourreria.

Turczaninow's original description of Aegiphila punctata Turcz. is as follows: "Ae. ramis acute tetragonis pulverulentis; foliis longe petiolatis ovato-lanceolatis, basi parum attenuatis, apice acuminatis integerrimis, supra glabris laevibus, subtus crebre reticulatis, in areolis dense punctatis cinerascentibus; cymis terminalibus et in axillis superioribus nascentibus, foliis brevioribus paniculatis, ramis oppositis bracteis lineari-lanceolatis suffultis; calyce 4-dentato; corollae tubo parum exserto cylindrico in limbum dilatato; filamentis brevissimis antherisque, forsan imperfectis, inclusis. Specimina nostra videntur foeminea. Jamaica, e collectione cl. Grahamii."

Little & Wadsworth (1964) describe the plant as follows: "A small to medium-sized tree characterized by: (1) the crown usually having a grayish color; (2) opposite long-stalked elliptic leaves with rough surfaces, green and almost hairless on upper surface, the lower surface pale yellow green and covered with minute scales and hairs and with prominent veins; (3) twigs 4-angled, finely hairy, green but becoming brown; (4) numerous small white flowers about 1/8 inch long and broad, with tubular 4-lobed corollas, borne in long-stalked lateral branched clusters and forming round juicy fruits about 5/16 inch in diameter, turning from green to red to black; and (5) gray bark slightly shreddy and separating into strips.

"A tree 20--70 feet high and 1 foot or more in trunk diameter, with spreading open crown, evergreen or nearly so. The rough fissured bark has brown and tasteless inner bark. The young twigs, petioles, and flower stalks are minutely hairy.

"Petioles are 1—2 1/2 inches long and blades 3—6 inches long and 1 1/2 — 3 inches broad, short-pointed at apex and rounded or short-pointed at base, slightly thickened, and without teeth on edges.

"Flower clusters (panicles) are 2—6 inches long, including the long stalks, and bear many minutely hairy, slightly fragrant flowers. Calyx is bell-shaped, 4-toothed; the white tubular corolla with 4 spreading lobes; stamens 4, minute, borne near mouth of corolla tube; and pistil with 2-celled ovary, slender style, and 2-lobed stigma. The fruits (drupes) are 1-seeded. Flowering and fruiting through the year.

"The light brown sapwood is not clearly separated from the very attractive light brown to medium brown heartwood, which frequently is variegated or marked by darker stripes. The wood is very hard, heavy (specific gravity 0.66), tough, strong, fine-textured, with straight, wavy, or interlocked grain, and without growth rings. It is susceptible or moderately resistant to attack by dry-wood termites and moderately durable in contact with the ground. The rate of air-seasoning is rapid, and the amount of degrade moderate. Machining characteristics are as follows: planing is fair; shaping, sanding, and resistance to screw splitting are good; and turning, boring, and mortising are excellent.

"Uses include furniture, light and heavy construction, posts and piling, crossties, and rollers for coffee-hulling mills. The wood is suitable also for cabinetmaking, turned articles, novelty items, interior paneling, farm implements, handles, and bridges.

"On hillsides, thickets and woods, in the coastal, limestone, and lower mountain regions of Puerto Rico. Also reported long ago from St. Croix and St. Thomas.

"This species is characteristic of openings in second-growth forests and probably is light-requiring. It is being tested in small plantations in Puerto Rico. The flowers attract bees....."

These authors give the range of the species as "Bahamas, Cuba, Cayman Islands, Jamaica, Hispaniola, and Puerto Rico. Also planted in southern Florida." They report the following common names: "capá amarillo", "capá blanco", "capá rosado", and "capá de sabana" in Puerto Rico, "capá de sabana", "capá sabanero", and "capá blanco" in the Dominican Republic, "roble guayo" and "guayo prieto" in Cuba, "petitia" and "bastard stopper" in the Bahamas, "fiddlewood" in Jamaica, and "bois d'ortie" and "chêne calebasier" in Haiti. Of these they recommend "capá blanco".

Additional & emended citations: BAHAMA ISLANDS: Abaco: Brace 1630 (F--183775), 1721 (F--183820). Andros: Brace 4899 (D--532417, F--199931, W--655497), 6718 (F--214132), 6960 (F--214365), 7074 (F--214470), 7088 (F--214483); Northrop & Northrop 358 (F--130507); Small & Carter 8702 (F--283712, W--758099). Cat: A. E. Wight 206 (F--225397). Eleuthera: Britton & Millspaugh 5603 (F--198430); A. S. Hitchcock s.n. [Eleuthera] (F--228058), s.n. [Governor's Harbor] (E--47341, F--174998). Great Bahama: Britton & Millspaugh 2593 (F--173717). New Providence: E. G. Britton 3269 (W--849219), 3288 (F--184027), 6539 (F--214034, W--845133); Brit-

ton & Brace 604 (F-171965); Curtiss 136 (E-118704, F-144030, W-428641); Eggers 4201 (F-131489); C. F. Mills 2090 (F-156052); P. Wilson 8325 (E-118699, F-246705). CUBA: Camagney: Poeppig s.n. [Las Piedras, Feb. 1824] (E-119129). Las Villas: Alain 3964 (W-2288251); Combs 169 (E-118706, F-357978, W-1431129); León 9584 (W-1047956). Oriente: Ekman 1939 (M1); Herb. Coll. Pharm. Neo-Ebor. s.n. [San Fernando] (Pa); C. Wright 428 (W-58033), 428 [1856-7] (D-612068), 428 [1859, 1860] (E-118700), 428 [1860] (Ca-936793, D-612069, E-118705), 1353 [1860] (D-612067, E-118701). ISLA DE PINOS: Blain 18 (F-78973); Morton 10120 (W-2350726), 10154 (W-2350753). CAYMAN ISLANDS: Grand Cayman: Collins & Kempton 15 (W-1585191); Crosby, Hespenheide, & Anderson 40 (M1); A. S. Hitchcock s.n. [1-18-'91] (E-118702), s.n. [Grand Cayman] (F-228140); C. F. Mills 1164 (F-611624). JAMAICA: Alexander Prior s.n. [1850] (D-610677); N. L. Britton 894 (F-201070); Campbell 6224 (F-145707); Crosby & Anderson 1118 (M1); W. Harris 5788 (F-145533), 7062 (F-146061), 8776 (F-174363), 9213 (F-212232, W-524656); Maxon & Killip 1497 (F-500901, W-1046543); G. S. Miller 1328 (W-1479054); G. L. Webster 5115 (M1); Webster, Ellis, & Miller 8211 (S). HISPANIOLA: Dominican Republic: Abbott 559 (W-1078622, W-1079546, W-1079567); B. Augusto 594 (N), 883 (N), 1427 (N), 1624 (N), 1690 (N); Faris 190 (W-1048465), 351 (W-1145909); Fuertes 195 (E-706520, F-385167, W-658264); Lavastre 1336 (N); Rose, Fitch, & Russell 3938 (W-760075); N. Taylor 140 (F-250795); Türkheim 3633 (W-695764); Valeur 273 (E-983932, F-715205, W-1273663); Wright, Parry, & Brummel 355 (F-575082, W-15278). Haiti: Ekman H.2185 (W-1412143); E. C. Leonard 3843 (W-1076213), 4833 (W-1077367, W-1077368); Leonard & Leonard 11575 (W-1450500), 12527 (W-1451280), 13913 (W-1452494), 15276 (W-1453550); Nash & Taylor 1395 (F-450752), 1396 (W-792217, W-792218). PUERTO RICO: Alain 9230 (N); Britton & Cowell 879 (F-201363, W-655946, W-847088); Britton, Stevens, & Hess 2388 (W-758789); Cowles 14 (W-697716); Heller & Heller 820 (F-119844, W-426033), 1229 (F-119989, W-426194); J. R. Johnston 304 (W-1475392); Johnston & Stevenson 840 (W-1475464); Sintenis 161 (W-1323321), 857 (W-1323320), 1073 (W-1323322), 1925 (E-118703, W-57681, W-57682, W-1323318), 2431 (W-1323319), 4268 (E-118697, F-79891), 5511 (F-80094, W-403898), 6375 (E-118698, W-103899); J. A. Stevenson 1761 (W-1475663); Stimson 1673 (M1); Underwood & Griggs 214 (W-405183), 215 (W-405184); Woodbury & Stimson 1313 (M1). CULTIVATED: Colombia: Cuatrecasas 23088 (Va). LOCALITY OF COLLECTION UNDETERMINED: Herb. Meisner s.n. [July] (M1).

PETITIA DOMINGENSIS var. *EKMANI* Moldenke

Additional synonymy: *Petitia domingensis* var. *ekmanii* Moldenke apud Jiménez, Supl. Cat. Fl. Doming. 1: 217. 1966.

Additional bibliography: Moldenke, Phytologia 7: 404. 1961; Jiménez, Supl. Cat. Fl. Doming. 1: 217--218. 1966; Moldenke, Résumé Suppl. 15: 21. 1967.

Emended citations: HISPANIOLA: Dominican Republic: Ekman H. 7009 (W--1304734--isotype).

PETITIA URBANII Ekm.

Additional bibliography: Moldenke, Inform. Mold. Set 51 Spec. 3. 1956; Anon., U. S. Dept. Agr. Bot. Subj. Index 15: 14358. 1958; Moldenke, Phytologia 7: 401 & 404--405. 1961; Moldenke, Biol. Abstr. 36: 3141. 1961; Hocking, Excerpt. Bot. A6: 533. 1963.

Morton & Alain report that this plant is found from sea-level to 200 meters altitude in Oriente, Cuba. A beautiful photograph of the plant, taken between Jauco and Montecristo, on the first terrace, in January, 1956, by Brother Alain, is preserved in the H. N. Moldenke herbarium.

Additional & emended citations: CUBA: Oriente: Morton & Alain 9163 (W--2285247). HISPANIOLA: Haiti: Ekman H.4096 (W--1303876--isotype, W--1479540--isotype).

ADDITIONAL NOTES ON THE GENUS *VITEX*. V

Harold N. Moldenke

VITEX COURSI Moldenke

Additional bibliography: G. Taylor, Ind. Kew. Suppl. 12: 151. 1959; Moldenke, Phytologia 15: 100. 1967.

VITEX CRENATA A. Chev.

Additional bibliography: Prain, Ind. Kew. Suppl. 5, pr. 1, 272 (1921) and pr. 2, 272. 1960; Moldenke, Phytologia 15: 100. 1967.

VITEX CUSPIDATA Hiern

Additional bibliography: Thiselt.-Dyer, Ind. Kew. Suppl. 2: 194. 1904; Moldenke, Phytologia 15: 100. 1967.

VITEX CYMOSEA Bert.

Additional & emended bibliography: Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 2: 1213. 1895; Prain, Ind. Kew. Suppl. 5, pr. 1, 273. 1921; Stapf, Ind. Lond. 6: 478. 1931; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 2, 2: 1213. 1946; Romero Castañeda, Caldasia 7: 49. 1955; Prain, Ind. Kew. Suppl. 5, pr. 2, 273. 1960; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 3, 2: 1213. 1960; Moldenke, Phytologia 15: 100--101. 1967.

VITEX DEGENERIANA Moldenke

Additional bibliography: Hill & Salisb., Ind. Kew. Suppl. 10: 244. 1947; Moldenke, Phytologia 15: 101. 1967.

VITEX DENTATA Klotzsch

Additional bibliography: Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 2: 1213 (1895), pr. 2, 2: 1213 (1946), and pr. 3, 2: 1213. 1960; Moldenke, Phytologia 15: 101. 1967.

VITEX DINKLAGEI Gürke

Additional bibliography: Prain, Ind. Kew. Suppl. 3: 189. 1908; Moldenke, Phytologia 15: 102. 1967.

VITEX DIVARICATA Sw.

Additional synonymy: Arrabidaea paniculata Seem. ex Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 1: 193. 1893.

Additional bibliography: Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 1: 193 (1893), 2: 1036, 1213, & 1214. 1895; Thiselt.-Dyer, Ind. Kew. Suppl. 2: 194. 1904; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 2, 1: 193 (1946), 2: 1036, 1213, & 1214 (1946), and pr. 3, 1: 193 (1960) and 2: 1036, 1213, & 1214. 1960; Moldenke, Phytologia 15: 102—104. 1967; Moldenke, Résumé Suppl. 15: 16. 1967.

Jackson (1895) maintains that Tanaecium ? paniculatum Sieber belongs in the synonymy of Jacaranda sagraeana P. DC. in the Bigoniaceae rather than in that of Vitex divaricata.

VITEX DIVERSIFOLIA Kurz

Additional bibliography: Kurz, Rep. Veget. Andaman Isls. A.45. 1870; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 2: 1213 (1895), pr. 2, 2: 1213 (1946), and pr. 3, 2: 1213. 1960; Moldenke, Phytologia 15: 104. 1967.

VITEX DJUMAENSIS DeWild.

Additional bibliography: Prain, Ind. Kew. Suppl. 4, pr. 1, 248 (1913) and pr. 2, 248. 1958; Moldenke, Phytologia 15: 104. 1967.

VITEX DONIANA Sweet

Additional & emended bibliography: Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 1213 & 1214. 1895; Thiselt.-Dyer, Ind. Kew. Suppl. 2: 194. 1904; Engl. in Engl. & Drude, Veget. Erde 9 (1): I, 295, fig. 261. 1910; Prain, Ind. Kew. Suppl. 5, pr. 1, 273. 1921; F. R. Irvine, Pl. Gold Coast xlii, lvii, lxvi, & 436—437. 1930; Stapf, Ind. Lond. 6: 478. 1931; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 2, 2: 1213 & 1214 (1946) and pr. 3, 2: 1213 & 1214. 1960; Prain, Ind. Kew. Suppl. 5, pr. 2, 273. 1960; Moldenke, Phytologia 15: 104—108. 1967.

Additional illustrations: Kotsch. & Peyr., Pl. Tinn. pl. 12. 1867; Engl. in Engl. & Drude, Veget. Erde 9 (1): I, 295, fig. 261. 1910.

VITEX DRYADUM S. Moore

Additional bibliography: Prain, Ind. Kew. Suppl. 5, pr. 1, 273

(1921) and pr. 2, 273. 1960; Moldenke, *Phytologia* 15: 108. 1967.

VITEX DUBOISII Moldenke

Additional bibliography: G. Taylor, *Ind. Kew. Suppl.* 12: 151. 1959; Moldenke, *Phytologia* 15: 108. 1967.

VITEX DUCKETI Huber

Additional bibliography: Prain, *Ind. Kew. Suppl.* 4, pr. 1, 248 (1913) and pr. 2, 248. 1958; Moldenke, *Phytologia* 15: 108. 1967.

VITEX DUCLOUXII Dop

Additional & emended bibliography: A. W. Hill, *Ind. Kew. Suppl.* 9: 297. 1938; Moldenke, *Phytologia* 15: 108. 1967.

VITEX EBERHARDTII Dop

Additional bibliography: A. W. Hill, *Ind. Kew. Suppl.* 9: 297. 1938; Moldenke, *Phytologia* 15: 108. 1967.

VITEX ELAKELAKENSIS Moldenke

Additional bibliography: G. Taylor, *Ind. Kew. Suppl.* 12: 151. 1959; Moldenke, *Phytologia* 15: 108. 1967.

VITEX EPIDICTYODES Mildbr.

Additional bibliography: A. W. Hill, *Ind. Kew. Suppl.* 8: 249. 1933; Moldenke, *Phytologia* 15: 108. 1967; Moldenke, *Résumé Suppl.* 15: 25. 1967.

VITEX ERIOCLONA H. J. Lam

Additional & emended bibliography: A. W. Hill, *Ind. Kew. Suppl.* 7: 252. 1929; Moldenke, *Phytologia* 8: 36—37. 1961.

VITEX EXCELSA Moldenke

Additional bibliography: Hill & Salisb., *Ind. Kew. Suppl.* 10: 244. 1947; Moldenke, *Phytologia* 8: 37. 1961.

VITEX FARAFANGANENSIS Moldenke

Additional bibliography: G. Taylor, *Ind. Kew. Suppl.* 12: 151. 1959; Moldenke, *Phytologia* 15: 108—109. 1967.

VITEX FERRUGINEA Schum. & Thonn. in Schum., *Beskr. Guin. Pl.* 62. 1827 [not *V. ferruginea* Bojer, 1847, nor Vahl, 1818].

Additional bibliography: Jacks. in Hook. f. & Jacks., *Ind. Kew.*, pr. 1, 2: 1213. 1895; Thiselt.-Dyer, *Ind. Kew. Suppl.* 2: 194. 1904; Prain, *Ind. Kew. Suppl.* 4, pr. 1, 248. 1913; Jacks. in Hook. f. & Jacks., *Ind. Kew.*, pr. 2, 2: 1213. 1946; Prain, *Ind. Kew. Suppl.* 4, pr. 2, 248. 1938; Jacks. in Hook. f. & Jacks., *Ind. Kew.*, pr. 3, 2: 1213. 1960; Moldenke, *Phytologia* 15: 109—110 & 229. 1967; Moldenke, *Résumé Suppl.* 15: 6, 7, & 25. 1967.

VITEX FISCHERI Gütcke

Additional bibliography: Durand & Jacks., *Ind. Kew. Suppl.* 1, pr. 1, 457 (1906), pr. 2, 457 (1941), and pr. 3, 457. 1959; Mol-

denke, *Phytologia* 15: 110. 1967.

VITEX FLAVA Ridl., *Kew Bull. Misc. Inf.* 1929: 261—262. 1929.

Additional bibliography: H. N. Ridl., *Kew Bull. Misc. Inf.* 1929: 261—262. 1929; A. W. Hill, *Ind. Kew. Suppl.* 8: 249. 1933; Moldenke, *Phytologia* 15: 110. 1967.

VITEX FLAVENS H.B.K.

Additional bibliography: Jacks. in Hook. f. & Jacks., *Ind. Kew.*, pr. 1, 2: 1213. 1895; Stapf, *Ind. Lond.* 6: 478. 1931; A. W. Hill, *Ind. Kew. Suppl.* 9: 298. 1938; Jacks. in Hook. f. & Jacks., *Ind. Kew.*, pr. 2, 2: 1213. 1946; Moldenke, *Phytologia* 6: 81 & 84. 1957; Jacks. in Hook. f. & Jacks., *Ind. Kew.*, pr. 3, 2: 1213. 1960; Moldenke, *Phytologia* 15: 110—111. 1967.

VITEX FLORIBUNDA Legris

Additional bibliography: Moldenke, *Phytologia* 15: 111. 1967; Moldenke, *Résumé Suppl.* 15: 9. 1967.

This binomial is not accounted for in the "Index Kewensis" nor any of its supplements to date.

VITEX FLORIDULA Duchass. & Walp.

Additional bibliography: Jacks. in Hook. f. & Jacks., *Ind. Kew.*, pr. 1, 2: 1213. 1895; Pittier, *Contrib. U. S. Nat. Herb.* 18: 171. 1916; Stapf, *Ind. Lond.* 6: 478. 1931; Jacks. in Hook. f. & Jacks., *Ind. Kew.*, pr. 2, 2: 1213 (1946) and pr. 3, 2: 1213. 1960; Moldenke, *Phytologia* 15: 111. 1967.

In the library of the New York Botanical Garden there are preserved six copies of a photograph of a cross-section of the wood of this species, taken from an unnumbered specimen collected by Muhl.

VITEX FOSTERI C. H. Wright

Further study indicates that this taxon is conspecific with V. ferruginea Schum. & Thonn., which see.

VITEX FROESII Moldenke

Additional bibliography: E. J. Salisb., *Ind. Kew. Suppl.* 11: 265. 1953; Moldenke, *Phytologia* 15: 111. 1967.

VITEX GABUNENSIS Gürke

Additional bibliography: Durand & Jacks., *Ind. Kew. Suppl.* 1, pr. 1, 457 (1906), pr. 2, 457 (1941), and pr. 3, 457. 1959; Moldenke, *Phytologia* 15: 111. 1967.

VITEX GAMOSEPALA Griff.

Additional bibliography: Jacks. in Hook. f. & Jacks., *Ind. Kew.*, pr. 1, 2: 1213 (1895), pr. 2, 2: 1213 (1946), and pr. 3, 2: 1213. 1960; Moldenke, *Phytologia* 15: 111. 1967.

VITEX GARDNERIANA Schau.

Additional bibliography: Jacks. in Hook. f. & Jacks., *Ind. Kew.*,

pr. 1, 2: 1213 (1895), pr. 2, 2: 1213 (1946), and pr. 3, 2: 1213. 1960; Moldenke, *Phytologia* 15: 111—112. 1967.

VITEX GAUMERI Greenm.

Additional bibliography: Prain, Ind. Kew. Suppl. 4, pr. 1, 248 (1913) and pr. 2, 248. 1958; Moldenke, *Phytologia* 15: 112. 1967; Moldenke, *Résumé Suppl.* 15: 25. 1967.

VITEX GEMINATA H. H. W. Pearson

Additional bibliography: Prain, Ind. Kew. Suppl. 3: 189. 1908; Moldenke, *Phytologia* 6: 23 (1957) and 15: 112. 1967.

VITEX GIGANTEA H.B.K.

Additional bibliography: Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 2: 1213 (1895), pr. 2, 2: 1213 (1946), and pr. 3, 2: 1213. 1960; Moldenke, *Phytologia* 15: 112. 1967.

VITEX GIORGII DeWild.

Additional bibliography: A. W. Hill, Ind. Kew. Suppl. 8: 249. 1933; Moldenke, *Phytologia* 15: 112—113. 1967.

VITEX GLABRATA R. Br.

Additional & emended bibliography: Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 2: 1213. 1895; Thiselet-Dyer, Ind. Kew. Suppl. 2: 194. 1904; Prain, Ind. Kew. Suppl. 3: 189 (1908), 4, pr. 1, 248 (1913), and 5, pr. 1, 273. 1921; Haines, Bot. Bihar & Orissa 4: 711 & 713. 1922; H. J. Lam in Bakh. & Lam, Nov. Guinea 14, Bot. 1: 169. 1924; C. A. Gardn., Enum. Pl. Austr. Occid. 3: 112. 1931; Kanehira, Fl. Micrones. 343 & 457. 1933; Fletcher, Kew Bull. Misc. Inf. 1938: 432 & 435—436. 1938; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 2, 2: 1213. 1946; Prain, Ind. Kew. Suppl. 4, pr. 2, 248. 1958; Anon., Kew Bull. Gen. Index 1929—1956, 293. 1959; Maun, Philip. Journ. Forest. 16: 108. 1960; Nath, Bot. Surv. South. Shan States 304. 1960; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 3, 2: 1213. 1960; Prain, Ind. Kew. Suppl. 5, pr. 2, 273. 1960; Moldenke, *Phytologia* 8: 63. 1961; Panigrahi, Chowdhury, Raju, & Deka, Bull. Bot. Surv. India 6: 255. 1964; Becker & Bakh., Fl. Java 2: 605. 1965; J. S. Beard, Descrip. Cat. W. Austr. Pl. 93. 1965; Moldenke, *Phytologia* 15: 79 & 113. 1967; Moldenke, *Résumé Suppl.* 15: 9 & 14. 1967.

Recent collectors describe this plant as a tree, 8—35 meters tall, the trunk 45 cm. in diameter, dark-gray, and rather rough, and the fruit black or purple, growing on marshy plains, flowering in June and October, fruiting in July, September, and October, and called "khai-nao", "mak-lokkaing", and "tauksha". It is said to be only "occasional" in Orissa. The corollas are described as "purple" on Herb. Roy. Forest. Dept. 2479 and as "white with purple tinge" by Beard (1966).

The W. V. Fitzgerald 212, distributed as V. glabrata, is actually V. acuminata R. Br., while Elmer 11602 and Yates 1609 are V. quinata var. puberula (H. J. Lam) Moldenke

Additional citations: INDIA: Assam: Koelz 30578 (M1). THAILAND: Boongird 7 (W-2035006); Kostermans 1222 (W-2039886), 1317 (W-2039923). INDONESIA: Celebes: Waturandang 35 [Boschproefst. BB.21118] (B1). Java: Veer 53 [Boschproefst. Ja.3305] (B1). MOUNTED ILLUSTRATIONS: H. N. Moldenke color slide 472 (Z).

VITEX GLABRATA var. BOMBACIFOLIA (Wall.) Moldenke

Additional bibliography: Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 2: 1213 & 1214 (1895) and pr. 2, 2: 1213 & 1214. 1946; Moldenke, Phytologia 5: 381-383. 1956; Moldenke, Résumé 164, 166, 177, 225, 381, 383, 385, 387, & 476. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 3, 2: 1213 & 1214. 1960.

Koelz describes this plant as a tree, the trunk 18 inches in diameter, the flowers rose, the lip darker, yellow at the base, blooming in June.

Additional citations: INDIA: Assam: Koelz 25327 (M1).

VITEX GLABRATA var. POILANEI Moldenke

Additional bibliography: Moldenke, Phytologia 8: 39. 1961.

Additional citations: INDOCHINA: Cambodia: Pierre 1218 (W-1757961).

VITEX GOLUNGENSIS J. G. Baker

Additional bibliography: K. Schum. in Just, Bot. Jahresber. 28 (1): 497 & 498. 1902; Thiselt.-Dyer, Ind. Kew. Suppl. 4: 194. 1904; Moldenke, Phytologia 5: 383-384. 1956; Moldenke, Résumé 147, 383, & 476. 1959.

VITEX GRANDIDIANA Pieper

Additional bibliography: A. W. Hill, Ind. Kew. Suppl. 8: 249. 1933; Moldenke, Phytologia 5: 384-385. 1956; Moldenke in Humbert, Fl. Madag. 174: 74, 109, 111-113, & 272, fig. 16 (7). 1956; Moldenke, Résumé 157 & 476. 1959.

Illustrations: Moldenke in Humbert, Fl. Madag. 174: 109, fig. 16 (7). 1956.

VITEX GRANDIDIANA var. ANGUSTIFOLIA Moldenke

Additional bibliography: Moldenke, Phytologia 5: 385. 1956; Moldenke in Humbert, Fl. Madag. 174: 74, 109, 112-113, & 272, fig. 16 (8 & 9). 1956; Moldenke, Résumé 157 & 476. 1959.

Illustrations: Moldenke in Humbert, Fl. Madag. 174: 109, fig. 16 (8 & 9). 1956.

VITEX GRANDIFOLIA Gürke

Emended synonymy: Vitex lutea A. Chev., Expl. Bot. Afr. Occid. Franç. 1: 506-507, hyponym. 1920 [not V. lutea Exell, 1931].

Vitex grandiflora Gürke ex F. R. Irvine, Pl. Gold Coast Ivi & 437, sphalm. 1930 [not V. grandiflora Turcz., 1863]. Vitex cuneata A. Chev. ex F. R. Irvine, Pl. Gold Coast 437, in syn. 1930 [not V. cuneata Schum. & Thonn., 1827, nor Thonn., 1827].

Additional bibliography: Durand & Jacks., Ind. Kew. Suppl. 1, pr. 1, 457. 1906; Prain, Ind. Kew. Suppl. 3: 189. 1908; J. H. Holland, Kew Bull. Addit. Ser. 9 [Useful Pl. Nigeria 3]: 526. 1915; A. W. Hill, Ind. Kew. Suppl. 6: 219. 1926; F. R. Irvine, Pl. Gold Coast lvi & 437. 1930; Exell in Exell, Good, & Taylor, Journ. Bot. 69, Suppl. 2: 145. 1931; Dalz., Useful Pl. W. Trop. Afr. 457—458. 1937; Durand & Jacks., Ind. Kew. Suppl. 1, pr. 2, 457 (1941) and pr. 3, 457. 1959; Moldenke, Phytologia 8: 39. 1961; Huber in Hutchinson & Dalz., Fl. W. Trop. Afr., ed. 2, 2: 445—447. 1963; Nielsen, Introd. Flow. Pl. W. Afr. 164. 1965; Moldenke, Phytologia 15: 105 & 106. 1967; Moldenke, Résumé Suppl. 15: 7. 1967.

This species is described by Nielsen (1965) as "a secondary forest species" and by Irvine (1930) as inhabiting "deciduous and secondary forests"; Huber (1963) says that it is found "in high or secondary forests". Additional vernacular names recorded for it are "awama.owama", "f@", and "nyaméle-kukwe" ["God's coconut"; from the acorn-like fruit and calyx]. Dalziel (1937) states that the names recorded by him for *V. doniana* Sweet also apply to *V. grandifolia*. He says "The plum-like fruits are yellow when ripe, but later turn black; they have a thin edible pulp and are used at various parts of the coast to make a spirit said to taste like rum. They are also used like those of *V. Cienkowski* to make a sweetmeat. The sapwood is white, the heart darkening to brown, more open-grained than teak, finishing smoothly, said to be durable and termite-proof. Large drums are made from it in S. Nigeria, and the smaller stems are used for home-building. In Sierra Leone the wood is sometimes burned for potash."

Vitex lutea Exell is apparently a valid species from the area of Portuguese Congo.

Huber (1963) cites the following specimens: SIERRA LEONE: Deighton 2386 & 3078, Mann 880, Scott-Elliot 4327, and Small 696. LIBERIA: Baldwin 5908 & 6171, Bequaert 152, Linder 966, and Whyte s.n. IVORY COAST: A. Chevalier 15470, 17275, & 19091, Leeuwenberg 1922, and Roberty 15559. GHANA: Andoh FH.5488, Kitson 1182, Morton A.379, Murphy 676, and Vigne FH.1041. NIGERIA: Southern: Barter 2098 & 2180, Keay FHL.25362, Onochie FHL.27686, and Talbot 2057. CAMEROONS: Maitland 361. He records it also from Spanish Guinea and describes it as "A small tree 20—30 ft. high with large 5-foliate leaves and pale-yellowish to brownish-yellow flowers in short-peduncled cymes at the base of the leaves." It has been found in flower from February to April, June, and August, and in fruit from April to June and August to November.

VITEX GRISEA J. G. Baker

Additional bibliography: K. Schum. in Just, Bot. Jahresber. 28 (1): 497. 1902; Thiselet.-Dyer, Ind. Kew. Suppl. 2: 194. 1904; Moldenke, Phytologia 5: 387—388. 1956; Moldenke, Résumé 145, 147, 384, & 476. 1959.

The Teixeira 10, distributed as *V. grisea*, is actually *V. wel-*

witschii Gurke.

VITEX GRISEA var. DEKINDTIANA (Gurke) Pieper

Additional bibliography: Prain, Ind. Kew. Suppl. 3: 189. 1908; Moldenke, Phytologia 5: 388. 1956; Moldenke, Résumé 147, 382, & 476. 1959.

VITEX GUERKEANA Hiern

Additional bibliography: Thisel.-Dyer, Ind. Kew. Suppl. 2: 194. 1904; Durand & Jacks., Ind. Kew. Suppl. 1, pr. 1, 457 (1906) and pr. 2, 457. 1941; Moldenke, Phytologia 5: 388—389. 1956; Moldenke, Résumé 147, 383, 388, & 476. 1959; Durand & Jacks., Ind. Kew. Suppl. 1, pr. 3, 457. 1959; Moldenke, Phytologia 15: 229. 1967.

The Tavares 856, distributed as V. guerkeana, is actually V. rufescens A. L. Juss.

VITEX GUERKEANA var. GOSSWEILERI Pieper

Additional bibliography: Moldenke, Phytologia 5: 389. 1956; Moldenke, Résumé 147 & 476. 1959.

VITEX GUIANENSIS Moldenke

Additional bibliography: E. J. Salisb., Ind. Kew. Suppl. 11: 265. 1953; Moldenke, Phytologia 5: 389—390. 1956; Moldenke, Résumé 76 & 476. 1959.

VITEX HARVEYANA H. H. W. Pearson

Additional bibliography: Prain, Ind. Kew. Suppl. 3: 189. 1908; J. Hutchinson, Botanist in South. Afr. 319. 1946; Moldenke, Phytologia 6: 23 (1957) and 8: 40. 1961.

Recent collectors describe this plant as a tree or large branched tree, or a shrub, 2—4 m. tall, with fragrant flowers, blooming from October to December, fruiting in November and December, and growing in river gallery forests, along the margins of rivers, and in rocky soil along stream margins. The corollas are described as "lilac" on Balsinhas 201 and F. A. Mendonca 3023, "violet, the lower lip rose" on F. A. Mendonca 2994, "with a violet lip" on Torre 6870, and "lower corolla lip blue" on F. A. Mendonca 2963. A note appended to Barbosa 750 points out that this specimen matches Schlechter 11731, which is the type of V. schlechteri, but that a complete series of intermediates may be seen, often on the same individual plant! Hutchinson (1946) describes the corollas as "mauve" and cites his nos. 2101 & 2123.

Material has been misidentified and distributed in herbaria as V. petersiana Klotzsch and V. rehmanni Gurke.

Additional citations: PORTUGUESE EAST AFRICA: Lourenço Marques: Balsinhas 201 (U1); Barbosa 750 (U1); Hornby 980 (U1), 981 (U1); F. A. Mendonca 2963 (U1), 2994 (U1), 3023 (U1), 3440 (U1); Torre 1831 (U1), 6870 (U1).

VITEX HAUSKNECHTII Bortm.

Additional & emended bibliography: Prain, Ind. Kew. Suppl. 4, pr. 1, 248 (1913) and pr. 2, 248. 1958; Moldenke, Phytologia 8: 40. 1961.

VITEX HAVILANDII Ridl.

Additional & emended bibliography: H. N. Ridl., Kew Bull. Misc. Inf. 1929: 262. 1929; A. W. Hill, Ind. Kew. Suppl. 8: 249. 1933; Moldenke, Phytologia 5: 392—393. 1956; Moldenke, Résumé 192, 193, & 476. 1959; Anon., Kew Bull. Gen. Index 1929—1956, 293. 1959.

VITEX HAYNGA Roxb.

Additional & emended bibliography: Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 2: 1213 (1895) and pr. 2, 2: 1213. 1946; Moldenke, Phytologia 5: 393. 1956; Moldenke, Résumé 164 & 476. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 3, 2: 1213. 1960.

VITEX HEMSLEYI Briq.

Additional bibliography: Thiselet.—Dyer, Ind. Kew. Suppl. 2: 194. 1904; P. C. Standl., Contrib. U. S. Nat. Herb. 23: 1235 & 1236. 1924; A. W. Hill, Ind. Kew. Suppl. 7: 56 & 252. 1929; Moldenke, Phytologia 8: 40. 1961; Langman, Select. Guide Lit. Flow. Pl. Mex. 160, 586, & 1010. 1964.

Rzedowski describes this plant as a tree, 5 m. tall, growing in subdeciduous tropical woods, at 100 m. altitude, flowering in June.

The type specimen, Jurgensen 68, deposited in the herbarium of the Conservatoire et Jardin Botaniques at Geneva, was photographed there by Macbride as his type photograph number 24702.

Additional citations: MEXICO: Colima: J. Rzedowski 15473 (Ip). Michoacán: Hinton 13789 (Rf). Oaxaca: Jurgensen 68 [Macbride photos 24702] (N—photo of type).

VITEX HENRYI Moldenke

Additional bibliography: Moldenke, Phytologia 5: 405—406. 1956; Moldenke, Résumé 171 & 476. 1959; G. Taylor, Ind. Kew. Suppl. 12: 151. 1959; E. H. Walker, Bibliog. East. Asiat. Bot. Suppl. 1: 235. 1960.

VITEX HEPTAPHYLLA A. L. Juss.

Additional bibliography: Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 2: 1213. 1895; A. W. Hill, Ind. Kew. Suppl. 9: 297. 1938; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 2, 2: 1213 (1946) and pr. 3, 2: 1213. 1960; Moldenke, Phytologia 8: 40—41. 1961.

Additional citations: HISPANIOLA: Dominican Republic: Lavastre 1824 (N).

VITEX HIRSUTISSIMA J. G. Baker

Additional & emended bibliography: Durand & Jacks., Ind. Kew.

Suppl. 1, pr. 1, 457 (1906) and pr. 2, 457. 1941; Moldenke, Phytologia 5: 409—410. 1956; Moldenke in Humbert, Fl. Madag. 174: 73, 76, 129—131, & 272, fig. 20 (3—5). 1956; Moldenke, Résumé 157 & 476. 1959; Durand & Jacks., Ind. Kew. Suppl. 1, pr. 3, 457. 1959.

Additional illustrations: Moldenke in Humbert, Fl. Madag. 174: 129, fig. 20 (3—5). 1956.

VITEX HOCKII DeWild.

Additional bibliography: Prain, Ind. Kew. Suppl. 5, pr. 1, 273 (1921) and pr. 2, 273. 1960; Moldenke, Phytologia 8: 41. 1961; Moldenke, Résumé Suppl. 12: 7. 1965.

Additional citations: ANGOLA: Mexico: Barros Machado s.n. [Ang. 1.55-358] (U).

VITEX HOLOADENON Dop

Additional & emended bibliography: A. W. Hill, Ind. Kew. Suppl. 9: 297. 1938; Moldenke, Phytologia 8: 41. 1961.

VITEX HOLOCALYX J. G. Baker

Additional bibliography: K. Schum. in Just, Bot. Jahresber. 28 (1): 497. 1902; Thiselet-Dyer, Ind. Kew. Suppl. 2: 194. 1904; Moldenke, Phytologia 5: 411—412. 1956; Moldenke, Résumé 147, 386, & 476. 1959.

VITEX HORNEI Hemsl.

Additional bibliography: A. W. Hill, Ind. Kew. Suppl. 6: 219. 1926; Moldenke, Phytologia 5: 412. 1956; Moldenke, Résumé 155, 389, & 476. 1959.

VITEX HUMBERTI Moldenke

Synonymy: Vitex humbertii Mold. ex Humbert, Trav. Sect. Scient. & Tech. Inst. Franç. Pond., ser. 6, Not. Carte Madag. 65. 1965.

Bibliography: Moldenke, Phytologia 3: 436—437 (1951) and 5: 412—413. 1956; Moldenke in Humbert, Fl. Madag. 174: 77, 142—145, & 272, fig. 23 (1—3). 1956; Moldenke, Résumé 157 & 476. 1959; G. Taylor, Ind. Kew. Suppl. 12: 151. 1959; Humbert, Trav. Sect. Scient. & Tech. Inst. Franç. Pond., ser. 6, Not. Carte Madag. 65. 1965; Moldenke, Résumé Suppl. 15: 25. 1967.

Illustrations: Moldenke in Humbert, Fl. Madag. 174: 145, fig. 23 (1—3). 1956.

VITEX HUMBERTI var. ANGUSTATA Moldenke

Bibliography: Moldenke, Phytologia 3: 437—438 (1951) and 5: 413—414. 1956; Moldenke in Humbert, Fl. Madag. 174: 77, 143—145, & 272, fig. 23 (4). 1956; Moldenke, Résumé 157 & 476. 1959.

Illustrations: Moldenke in Humbert, Fl. Madag. 174: 145, fig. 23 (4). 1956.

VITEX HYPOLEUCA Schau.

Additional bibliography: Jacks. in Hook. f. & Jacks., Ind. Kew.,

pr. 1, 2: 1213 (1895) and pr. 2, 2: 1213. 1946; Moldenke, *Phytologia* 5: 414—415. 1956; Moldenke, *Résumé* 111, 381, 384, & 476. 1959; Jacks. in Hook. f. & Jacks., *Ind. Kew.*, pr. 3, 2: 1213. 1960.

An isotype, Blanchet 1907, deposited in the herbarium of the Conservatoire et Jardin Botaniques at Geneva, was photographed there by Macbride as his type photograph number 7881. An isotype of V. blancheti, Blanchet 1028, in the same herbarium, is represented by his type photograph number 30186.

Additional citations: BRAZIL: Bahia: Blanchet 1907 [Macbride photos 7881] (W—photo of isotype). State undetermined: Blanchet 1028 [Macbride photos 30186] (W—photo).

VITEX IBARENSIS J. G. Baker

Additional bibliography: Jacks. in Hook. f. & Jacks., *Ind. Kew.*, pr. 1, 2: 1213 (1895) and pr. 2, 2: 1213. 1946; Moldenke, *Phytologia* 5: 415—416. 1956; Moldenke in Humbert, *Fl. Madag.* 174: 74, 108—110, & 272, fig. 16 (4). 1956; Moldenke, *Résumé* 157 & 476. 1959; Jacks. in Hook. f. & Jacks., *Ind. Kew.*, pr. 3, 2: 1213. 1960.

Illustrations: Moldenke in Humbert, *Fl. Madag.* 174: 109, fig. 16 (4). 1956.

VITEX IMPRESSINERVIA Mildbr.

Additional & emended bibliography: A. W. Hill, *Ind. Kew. Suppl.* 8: 249. 1933; Moldenke, *Phytologia* 5: 416. 1956; Moldenke, *Résumé* 139 & 476. 1959.

VITEX INTEGRIFOLIA Urb.

Additional bibliography: A. W. Hill, *Ind. Kew. Suppl.* 7: 252. 1929; Moldenke, *Phytologia* 8: 41. 1961; Jiménez, *Suppl. Cat. Fl. Doming.* 1: 222. 1966.

VITEX IRAQUENSIS Moldenke

Bibliography: Moldenke, *Phytologia* 4: 61—62 (1952) and 5: 417—418. 1956; Moldenke, *Résumé* 158 & 476. 1959; G. Taylor, *Ind. Kew. Suppl.* 12: 151. 1959; Moldenke, *Phytologia* 15: 78. 1967.

VITEX IRINGENSIS Gürke

Additional bibliography: K. Schum. in Just, *Bot. Jahresber.* 28 (1): 497. 1902; Moldenke, *Phytologia* 5: 418—419. 1956; Moldenke, *Résumé* 145 & 476. 1959.

VITEX ISOTJENSIS Gibbs

Additional & emended bibliography: Prain, *Ind. Kew. Suppl.* 4, pr. 1, 248. 1913; Moldenke, *Phytologia* 5: 419—420. 1956; Prain, *Ind. Kew. Suppl.* 4, pr. 2, 248. 1958; Moldenke, *Résumé* 148 & 476. 1959.

VITEX KAPIRENSIS DeWild.

Additional & emended bibliography: Prain, *Ind. Kew. Suppl.* 5,

pr. 1, 273. 1921; Moldenke, *Phytologia* 5: 420. 1956; Moldenke, *Résumé* 142 & 476. 1959; Prain, *Ind. Kew. Suppl.* 5, pr. 2, 273. 1960.

VITEX KENIENSIS Turrill

Additional bibliography: Prain, *Ind. Kew. Suppl.* 5, pr. 1, 273 (1921) and pr. 2, 273. 1960; Moldenke, *Phytologia* 8: 63. 1961.

Additional citations: KENYA: Drummond & Hemsley 4752 (B).

VITEX KLUGII Moldenke

Additional bibliography: A. W. Hill, *Ind. Kew. Suppl.* 9: 297. 1938; Hill & Salisb., *Ind. Kew. Suppl.* 10: 244. 1947; Moldenke, *Phytologia* 8: 42. 1961.

Guedes records the vernacular name "tarumã" for this species.

Additional citations: BRAZIL: Ceará: Guedes 567 (N).

VITEX KRUKOVII Moldenke

Additional bibliography: E. J. Salisb., *Ind. Kew. Suppl.* 11: 265. 1953; Moldenke, *Phytologia* 8: 42. 1961.

VITEX KUYLENII Standl.

Emended synonymy: Vitex longeracemosa Pittier ex Standl., *Trop. Woods* 37: 37. 1934. Vitex kuylenii Staudt. ex Menninger, *Flow. Trees World* 284, sphalm. 1962.

Additional bibliography: A. W. Hill, *Ind. Kew. Suppl.* 7: 252 (1929) and 8: 249. 1933; P. C. Standl., *Trop. Woods* 37: 37. 1934; Anon., U. S. Dept. Agr. Bot. Subj. Index 15: 14362. 1958; Moldenke, *Phytologia* 8: 42. 1961; Menninger, *Flow. Trees World* 284. 1962.

Recent collectors describe this plant as a large tree, 13-15 m. tall, the trunk 6-12 inches in diameter, with the flowers in panicles, called "blue blossom" or "flor azul", and fruiting in May. The corollas are described as "blue" on Gentle 5551 and as "lovely blue" by Standley (1934).

Additional citations: MEXICO: Chiapas: Hernández Xolocotzi 232 (Rf). BRITISH HONDURAS: Gentle 4610 (Mi, Rf, Rf), 5551 (Ld, S), 6769 (Ld, S), 7774 (Ld).

VITEX KWANGSIENSIS P'ei

Additional & emended bibliography: A. W. Hill, *Ind. Kew. Suppl.* 9: 297. 1938; Moldenke, *Phytologia* 8: 42. 1961.

VITEX KWEICHOWENSIS P'ei

Additional & emended bibliography: P'ei, *Sinensia* 2: 71-74, fig. 1 & 2. 1932; A. W. Hill, *Ind. Kew. Suppl.* 9: 297. 1938; Moldenke, *Phytologia* 5: 428-429. 1956; Anon., U. S. Dept. Agr. Bot. Subj. Index 15: 14352. 1958; Moldenke, *Résumé* 171 & 476. 1959.

Emended illustrations: P'ei, *Sinensia* 2: 72 & 73, fig. 1 & 2. 1932.

VITEX LACINIOSA Turcz.

This binomial proves to be a synonym of V. polygana var. duzenii Moldenke, which see.

VITEX LAMIANA Pieper

Additional & emended bibliography: A. W. Hill, Ind. Kew. Suppl. 8: 249. 1933; Moldenke, Phytologia 5: 430. 1956; Moldenke, Résumé 145, 146, & 476. 1959.

VITEX LANIGERA Schau.

Additional bibliography: Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 2: 1214 (1895) and pr. 2, 2: 1214. 1946; Moldenke in Humbert, Fl. Madag. 174: 72, 85--88, & 272, fig. 11 (7--9). 1956; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 3, 2: 1214. 1960; Moldenke, Phytologia 8: 42. 1961.

Illustrations: Moldenke in Humbert, Fl. Madag. 174: 85, fig. 11 (7--9). 1956.

VITEX LASIANTHA H. Hallier

Additional bibliography: H. J. Lam in Bakh. & Lam, Nov. Guinea 14, Bot. 1: 169. 1924; A. W. Hill, Ind. Kew. Suppl. 6: 219. 1926; Moldenke, Phytologia 5: 432--433. 1956; Moldenke, Résumé 202 & 476. 1959.

VITEX IASTELLEI Moldenke

Bibliography: Moldenke, Phytologia 3: 438--439 (1951) and 5: 433--434. 1956; Moldenke in Humbert, Fl. Madag. 174: 75, 121, 123--124, & 272, fig. 18 (8 & 9). 1956; Moldenke, Résumé 157 & 476. 1959; G. Taylor, Ind. Kew. Suppl. 12: 151. 1959.

Illustrations: Moldenke in Humbert, Fl. Madag. 174: 121, fig. 18 (8 & 9). 1956.

VITEX LEANDRII Moldenke

Bibliography: Moldenke, Phytologia 3: 439--440 (1951) and 5: 434--435. 1956; Moldenke in Humbert, Fl. Madag. 174: 77, 139--141, & 272, fig. 22 (5--7). 1956; Moldenke, Résumé 157 & 476. 1959; G. Taylor, Ind. Kew. Suppl. 12: 151. 1959.

Illustrations: Moldenke in Humbert, Fl. Madag. 174: 139, fig. 22 (5--7). 1956.

VITEX LEBRUNI Moldenke

Bibliography: Moldenke, Phytologia 4: 62--63 (1952) and 5: 435. 1956; Moldenke, Résumé 142 & 476. 1959; G. Taylor, Ind. Kew. Suppl. 12: 151. 1959.

VITEX LEHMBACHII Gürke

Additional bibliography: Prain, Ind. Kew. Suppl. 3: 189. 1908; Moldenke, Phytologia 5: 435--436. 1956; Moldenke, Résumé 139 & 476. 1959; Huber in Hutchinson & Dalz., Fl. W. Trop. Afr., ed. 2, 2: 445 & 446. 1963.

Huber (1963) describes this plant as a "shrub or small tree up to 30 ft. high with glabrous branches and leaves, and long-

peduncled cymes of pale pink or white flowers." He cites Maitland 1725 and Olorunfemi FHI.30629 from Cameroons.

VITEX LEUCOXYLON L. f.

Additional bibliography: Bocq., Adansonia 3: [Rev. Verbenac.] 253. 1863; W. A. Talbot, Syst. List Trees Shrubs Bomb. 162 & 229. 1894; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 2: 1214. 1895; Haines, Bot. Bihar & Orissa 4: 711—713. 1922; Gamble, Fl. Madras 6: 1102 & 1103. 1924; H. F. MacMillan, Trop. Plant. & Gard., ed. 1, 207 & 592. 1925; Stapf, Ind. Lond. 6: 478. 1931; H. F. MacMillan, Trop. Plant. & Gard., ed. 4, 197 & 558. 1935; Fletcher, Kew Bull. Misc. Inf. 1938: 436. 1938; H. F. MacMillan, Trop. Plant. & Gard., ed. 5, pr. 1, 197 & 558. 1943; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 2, 2: 1214. 1946; H. F. MacMillan, Trop. Plant. & Gard., ed. 5, pr. 2, 197 & 558. 1948; Anon., Kew Bull. Gen. Index 1929-1956, 293. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 3, 2: 1214. 1960; Moldenke, Phytologia 8: 42. 1961; Nair & Rehman, Bull. Bot. Gard. Lucknow 76: 21. 1962; Jain, Bull. Bot. Surv. India 5: 225. 1963; D. S. Rao, Naturwiss. 52 (10): 262. 1965; Anon., Biol. Abstr. 47: 2888. 1966; Gaussen & al., Trav. Sect. Scient. & Tech. Inst. Franç. Pond. Hors ser. 7: 50 & 104. 1966; Moldenke, Résumé Suppl. 15: 25. 1967.

Chand describes this plant as a tree, with a trunk 2 feet in diameter and the corollas "white with a purple brush in throat", flowering in March. Nair & Rehman (1962) describe the pollen as subprolate, $21 \times 17 \mu$; range $19-21 \times 17-19 \mu$, the ectine surface granulate. Jain (1963) records the vernacular names "bereundemaran", "jamela", and "undemaran", and tells us that anemic patients and those with fever are given baths in a decoction made of the leaves of this species. The specific epithet is very often uppercased.

Fletcher (1938) reduces "V. leucoxydon L." to synonymy under V. glabrata R. Br., but it is actually only the Schauerian homonym that belongs in that synonymy.

Additional citations: INDIA: Bastar: Chand 1349 (Ml).

VITEX LIMONIFOLIA Wall.

Additional & emended bibliography: Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 2: 1213 & 1214. 1895; Craib, Kew Bull. Misc. Inf. 9: 443. 1911; Fletcher, Kew Bull. Misc. Inf. 1938: 431 & 433. 1938; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 2, 2: 1213 & 1214. 1946; Anon., Kew Bull. Gen. Index 1929-1956, 293. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 3, 2: 1213 & 1214. 1960; Moldenke, Phytologia 8: 43. 1961; Moldenke, Dansk Bot. Arkiv 23: 92. 1963.

Recent collectors describe this plant as a tree, 6—10 m. tall, the blaze green and orange over tan, growing in open sun or "dominant in deciduous forest" or "in scrub with occasional trees to 15 m. tall, common genera are Vitex, Bauhinia, and Lantana", flowering in June. It has been found growing at altitudes of 40—400 m. The corollas are described as "cream-color" on R. M. King

5474 and "lavender" on his 5488. A wood voucher accompanies R. M. King 5474.

Additional citations: THAILAND: Gram & Syrach-Larsen 86 (Cp); R. M. King 5488 (Du--502281); K. Larsen 8101 (Z). CULTIVATED: Thailand: R. M. King 5474 (Du--502242).

VITEX LINDENI Hook. f.

Emended synonymy: Vitex lindenii Hook. f. ex Stapf, Ind. Lond. 6: 478. 1931.

Additional bibliography: Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 2: 1214. 1895; Stapf, Ind. Lond. 6: 478. 1931; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 2, 2: 1214. 1946; W. J. Bean in Chittenden, Roy. Hort. Soc. Dict. Gard. 4: 2249. 1951; Moldenke, Phytologia 5: 440--441. 1956; Moldenke, Résumé 225, 385, & 476. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 3, 2: 1214. 1960.

VITEX LOBATA Moldenke

Bibliography: Moldenke, Phytologia 3: 440--441 (1951) and 5: 442. 1956; Moldenke in Humbert, Fl. Madag. 174: 74, 107--109, & 272, fig. 16 (1--3). 1956; Moldenke, Résumé 157 & 476. 1959; G. Taylor, Ind. Kew. Suppl. 12: 151. 1959.

Illustrations: Moldenke in Humbert, Fl. Madag. 174: 109, fig. 16 (1--3). 1956.

VITEX LOBKOWITZII Ettingsh.

Additional bibliography: Moldenke, Phytologia 5: 442--443. 1956; Moldenke, Résumé 227 & 476. 1959.

VITEX LOKUNDJENSIS Pieper

Additional bibliography: A. W. Hill, Ind. Kew. Suppl. 8: 249. 1933; Moldenke, Phytologia 8: 43. 1961.

Additional citations: CAMEROONS: Zenker 3899 (W--554334). TANGANYIKA: Schlieben 3148 (W--2214403).

VITEX LOKUNDJENSIS var. KRUCKEI Pieper

Additional bibliography: Moldenke, Phytologia 5: 444. 1956; Moldenke, Résumé 139, 142, 384, 385, & 476. 1959.

VITEX LONGIPETIOLATA Gürke

Additional bibliography: Prain, Ind. Kew. Suppl. 3: 189. 1908; Moldenke, Phytologia 8: 43. 1961.

Material of this taxon has been misidentified and distributed in herbaria as V. rivularis Gürke. On the other hand, the Monteiro & Murta 209 and Murta 39, distributed as V. longipetiolata, are actually V. vermoeseni DeWild.

Additional citations: CAMEROONS: Zenker s.n. [Bipindi] (Mi).

VITEX LONGISEPALA King & Gamble

Additional bibliography: Prain, Ind. Kew. Suppl. 4, pr. 1, 248. 1913; Fletcher, Kew Bull. Misc. Inf. 1938: 432 & 436. 1938; Prain,

Ind. Kew. Suppl. 4, pr. 2, 248. 1958; Anon., Kew Bull. Gen. Index 1929-1956, 293. 1959; Moldenke, Phytologia 8: 63-64. 1961; Moldenke, Dansk Bot. Arkiv 23: 92. 1963.

Recent collectors have found this species growing between 200 and 400 meters altitude in Thailand. Material has been misidentified and distributed in herbaria as V. pinnata L.

Additional citations: THAILAND: Gram & Syrach-Larsen 110 (Op).

VITEX LUCENS T. Kirk

Additional synonymy: Ephialis pentaphylla Banks & Soland. ex A. Cunn., Ann. Nat. Hist., ser. 1, 1: 461, in syn. 1838. Vitex luscens T. Kirk ex Moldenke, Résumé Suppl. 3: 42, in syn. 1962.

Additional & emended bibliography: A. Cunn., Ann. Nat. Hist., ser. 1, 1: 461. 1838; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 1: 844 (1893) and 2: 1214. 1895; Perkin, Journ. Chem. Soc. 73: 1019. 1898; A. W. Hill, Ind. Kew. Suppl. 9: 297. 1938; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 2, 1: 844 (1946) and 2: 1214. 1946; Neal, In Gard. Hawaii, ed. 1, 643. 1948; Karrer, Konstit. & Vork. Organ. Pflanzenst. 590. 1958; Briggs & Cambie, Tetrahedron 3: 269. 1958; Mattoon, Pl. Buyers Guide, ed. 6, 294. 1958; Seikel & Bushnell, Journ. Organ. Chem. 24: 1995. 1959; Cambie, N. Zeal. Journ. Sci. Technol. 2: 230. 1959; Seikel, Holder, & Birzgalis, Arch. Biochem. Biophys. 85: 272. 1959; Maun, Philip. Journ. Forest. 16: 108. 1960; R. E. Harrison, Handb. Trees & Shrubs, rev. ed., 330. 1960; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 3, 1: 844 (1960) and 2: 1214. 1960; Moldenke, Phytologia 8: 64. 1961; Seikel in Runckles, Proc. Sympos. Pl. Phenol. Group 31. 1963; S. A. Br., Science 142: 1198. 1963; E. E. Lord, Shrubs & Trees Austr. Gard., rev. ed., 97. 1964; Menninger, Seaside Pl. 186 & 188, pl. 287. 1964; Seikel & Mabry, Tetrahedron Lett. 16: 1105-1109. 1965; Hånsel, Leuckert, Rimpler, & Schaaf, Phytochem. 4: 19, 21, & 27. 1965; Neal, In Gard. Hawaii, new rev. ed., 729. 1965; Sampson & McLean, N. Zeal. Journ. Bot. 3: 104-112. 1965; H. Wagner in Swain, Compar. Phytochem. 310. 1966; T. Swain, Compar. Phytochem. 348. 1966; Seikel & Mabry, Biol. Abstr. 47: 3343. 1966; Sampson & McLean, Biol. Abstr. 47: 756. 1966; Anon., Biol. Abstr. 47 (8): S.146 (1966) and 47 (22): S.163. 1966; Moldenke, Résumé Suppl. 15: 15. 1967.

Additional illustrations: Menninger, Seaside Pl. 186, pl. 287. 1964.

Menninger (1964) describes this plant as a fast-growing evergreen tree, to 30 feet tall, with very dark-green glossy leaves. In spring it bears quantities of large red berries [actually they are drupes] that attract birds. Lord (1964) tells us that its figured and durable timber is highly valued in Australia". The Browns maintain that it is the "most valuable hardwood tree in the colony". Mattoon (1958) lists only one horticultural source for it. Sampson & McLean (1965) report that pits of a non-pathological nature are found on the under surface of the leaflets. Harrison (1960) describes some old trees of this species as 75 feet tall, with a trunk girth of 18 feet at breast height, estimated

to be 2000 years of age!

Brown (1963) says "Vitex lucens, the classical source of vitexin, has been shown by Seikel to contain additional glycoflavonoids, among which luteolin derivatives possibly containing two side chains are of greatest interest." Seikel & Mabry (1965) report the presence of the pigment, lucenin-1, a new type of glycoflavonoid, in this species.

Additional citations: NEW ZEALAND: North Island: Brown & Brown 166 (Bi), 311 (Bi); Herb. Coll. Hawaii s.n. [Wahauparei, June 29, 1912] (Bi); MacDaniels 1176 (Bi); Meebold 4972 (Bi, Bi). CULTIVATED: Hawaiian Islands: G. C. Munro s.n. [Jan. 13, 1940] (Bi). New Zealand: C. Morison s.n. [Nov. 1931] (Bi, Bi).

VITEX LUNDENSIS Gürke

Additional bibliography: Durand & Jacks., Ind. Kew. Suppl. 1, pr. 1, 457 (1906) and pr. 2, 457. 1941; Moldenke, Phytologia 5: 448. 1956; Moldenke, Résumé 142 & 476. 1959; Durand & Jacks., Ind. Kew. Suppl. 1, pr. 3, 457. 1959.

VITEX LUTEA Exell in Exell, Good, & Taylor, Journ. Bot. 69, Suppl. 2: 145. 1931.

Bibliography: Exell, Good, & Taylor, Journ. Bot. 69, Suppl. 2: 145. 1931; A. W. Hill, Ind. Kew. Suppl. 9: 297. 1938; Moldenke, Résumé Suppl. 15: 7. 1967; Moldenke, Phytologia 15: 245. 1967.

Shrub or small tree, about 4 m. tall, branched toward the top, fulvous-tomentose on the young parts; stems several from the same rootstock; branchlets fulvous-pilose; leaves decussate-opposite, 3--5-foliolate, long-petiolate; petioles to 6 cm. long, fulvous-pilose or -pilosulous; leaflets more shortly petiolulate, the blades obovate or narrowly obovate, about 7 cm. long and 4 cm. wide, the lateral ones smaller, rounded at the apex, entire, rounded or cuneate at the base, shiny on both surfaces, sparsely puberulent especially along the venation; secondaries 7 or 8 per side, rather inconspicuous above, prominulous beneath; inflorescence to 17 cm. long; flowers small, short-pedicellate, borne in long-pedunculate many-flowered cymes; peduncles 2--3 times as long as the petioles; bractlets linear, fulvous-pilose; calyx campanulate, 1.2 mm. long to the ends of the teeth, sericeous-tomentose with fulvous hairs, the teeth deltoid; corolla lurid-yellow, with a violet lip, bilabiate, 2.5 mm. long, twice as long as the calyx, pubescent, the upper lip 1.6 mm. long or almost twice as long as the tube; stamens 4, 1.5 mm. long, subequal; ovary subglobose, 1 mm. in diameter, glabrous; style eventually 2.2 mm. long, bifid at the apex.

The type of this species was collected by John Gossweiler (no. 7250) in clearings in the forest at Buco Zau, Portuguese Congo, flowering in August. Exell (1931) says "The very small flowers are reminiscent of V. rivularis Gürke, but the shape of the leaflets is quite different. There is also a certain resemblance to some forms of the widespread V. madiensis Oliv., but the new spe-

cies can be distinguished by the reddish-brown indumentum." The earlier homonym, V. lutea A. Chev. (1920), is a synonym of V. grandifolia Gürke and was published without a description so does not preclude the use of the epithet "lutea" for the present taxon.

I know nothing of this plant except what is given in the literature.

VITEX LUTEOGLANDULOSA H. J. Lam

Additional bibliography: A. W. Hill, Ind. Kew. Suppl. 6: 219. 1926; Moldenke, Phytologia 8: 44. 1961.

VITEX LUZONICA H. J. Lam

Additional bibliography: A. W. Hill, Ind. Kew. Suppl. 7: 252. 1929; Moldenke, Phytologia 5: 449--450. 1956; Moldenke, Résumé 185 & 477. 1959.

VITEX MACROFOLIOLA Moldenke

Additional bibliography: A. W. Hill, Ind. Kew. Suppl. 6: 219. 1926; Moldenke, Phytologia 5: 450. 1956; Moldenke, Résumé 202, 386, & 477. 1959; G. Taylor, Ind. Kew. Suppl. 13: 144. 1966.

VITEX MADAGASCARIENSIS Moldenke

Bibliography: Moldenke, Phytologia 3: 441--442 (1951) and 5: 450--451. 1956; Moldenke in Humbert, Fl. Madag. 174: 76, 125, 127--128, & 272, fig. 19 (7--9). 1956; Moldenke, Résumé 157 & 477. 1959; G. Taylor, Ind. Kew. Suppl. 12: 151. 1959.

Illustrations: Moldenke in Humbert, Fl. Madag. 174: 125, fig. 19 (7--9). 1956.

VITEX MADIENSIS Oliv.

Additional synonymy: Vitex pobeguini Aubrév., Fl. Forest. Soudano-Guin. 502. 1950. Vitex nadiensis Oliv. ex Expirito Santo, Junt. Invest. Ultramar Est. Ens. & Docum. 104: 31, sphalm. 1963.

Additional bibliography: Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 2: 1214. 1895; Gürke in Engl., Pfl. Ost-Afr. C:339. 1895; K. Schum. in Just, Bot. Jahresber. 28 (1): 497. 1902; Durand & Jacks., Ind. Kew. Suppl. 1, pr. 1, 457. 1906; Volkens, Notizbl. Bot. Gart. Berl. 5, App. 22 (2): 34. 1909; Stapf, Ind. Lond. 6: 479. 1931; Hutchinson & Dalz., Fl. W. Trop. Afr., ed. 1, 2: 276. 1937; Dalz., Useful Pl. W. Trop. Afr. 456. 1937; Durand & Jacks., Ind. Kew. Suppl. 1, pr. 2, 457. 1941; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 2, 2: 1214. 1946; Aubrév., Fl. Forest. Soudano-Guin. 502, 504, 506, & 507, pl. 115, fig. 1--3. 1950; E. J. Salisb., Ind. Kew. Suppl. 11: 265. 1953; Moldenke, Phytologia 6: 80. 1957; Durand & Jacks., Ind. Kew. Suppl. 1, pr. 3, 457. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 3, 2: 1214. 1960; Moldenke, Phytologia 8: 44. 1961; Cuf., Bull. Jard. Bot. Brux. 32: Suppl. 797. 1962; Huber in Hutchinson & Dalz., Fl. W. Trop. Afr., ed. 2, 2: 445 & 447. 1963; Espirito Santo, Junt. Invest. Ultramar Est. Ens. & Docum. 104: 27, 31, & 118. 1963; Moldenke, Résumé Suppl. 11: 8 (1964), 12: 7 (1965), and 15: 5, 6, & 25. 1967; Mol-

denke, *Phytologia* 15: 105 & 256. 1967.

Additional illustrations: Aubrév., *Fl. Forest. Soudano-Guin.* pl. 115, fig. 1--3. 1950.

Huber (1963) erroneously cites the original publication of *V. madiensis* to "*Oliv. in Trans. Linn. Soc.* 29: 35, t. 131 (1890)". He says that *A. Chevalier* 12467, cited by Chevalier, is actually *Harrisonia abyssinica* Oliv. He reduces *V. barbata* Oliv. to synonymy under *V. madiensis*, but with this disposition I do not agree.

Espirito Santo (1963) records the vernacular names "bômè" and "cetona" both for this species and for *V. doniana* Sweet, while Martins records "tshilongo-longo-tshamo-tshana". Recent collectors describe the plant as a bush, 10 feet tall, growing in savannas at 750 meters altitude, flowering in March, April, and September, and fruiting from May to July.

Huber (1963) describes the plant as a "Shrub or small tree with the young parts densely pubescent; flowers pilose, yellowish and blue-purple in long-peduncled cymes; in savanna." He cites: SENEGAL: *Berhaut* 106, *Heudelot* 30, *Perottet* 658. GAMBIA: *Dalziel* 8061, *Frith* 77, *Ingram* s.n. MALI: *A. Chevalier* 510 bis, 511, *Vuillet* 618. PORTUGUESE GUINEA: *Espirito Santo* 1142, 2484, 3030. GUINEA: *A. Chevalier* 496, *Maclaud* 64, *Pobéguin* 2007. SIERRA LEONE: *Deighton* 5430, *Scott Elliot* 4881 & 5189, *Thomas* 152 & 160. IVORY COAST: *Herb. Serv. For.* 428 bis. GHANA: *Kitson* 689 & 835, *Vigne* FH.3786. NIGERIA: Northern: *Lely* 14. He notes that the species is also found "in savanna areas of Camerouns, Gabon, Ubangi-chari, Sudan, Uganda, Congo, Northern Rhodesia, Mozambique, & Angola."

Material has been misidentified and distributed in herbaria as *V. cienkovskii* Kotschy & Peyr. On the other hand, the *Torre* 6264, distributed as *V. madiensis*, is actually var. *milanjiensis* (Britten) Pieper.

Additional citations: CONGO LEOPOLDVILLE: *Bequaert* 21 (W--1659334). ANGOLA: Lunda: *Gossweiler* 13623 (W--2074112), 13624 (Ul). Province undetermined: *V. Martins* s.n. [Sombo, VEG.105] (Ul).

VITEX MADIENSIS var. ANGUSTIFOLIA Pieper

Additional bibliography: Moldenke, *Phytologia* 5: 455. 1956; Moldenke, *Résumé* 134 & 477. 1959.

VITEX MADIENSIS var. AROMATICA Pieper

Additional bibliography: Moldenke, *Phytologia* 5: 455. 1956; Moldenke, *Résumé* 137, 143, 389, & 477. 1959.

VITEX MADIENSIS var. BAUMII Pieper

Additional bibliography: Moldenke, *Phytologia* 5: 455--456. 1956; Moldenke, *Résumé* 142, 147, 381, & 477. 1959; Moldenke, *Résumé Suppl.* 12: 7. 1965.

Recent collectors describe this plant as a small tree or shrub,

4--5 m. tall, or rhizomatous, few-stemmed, and to 60 cm. tall, flowering in February and March, fruiting in March, and called "tshilongu-lomgu".

Additional citations: ANGOLA: Bie-Cuando-Cubango: E. J. Mendes 2632 (U1). Cuanza-Sul: Barbosa 8310 (U1). Lunda: Luna de Carvalho s.n. [ANG. VI.54-87] (U1).

VITEX MADIENSIS var. DARBANDENSIS A. Chev.

Additional bibliography: Moldenke, Phytologia 5: 456. 1956; Moldenke, Résumé 140 & 477. 1959.

VITEX MADIENSIS var. GLABERRIMA Moldenke

Bibliography: Moldenke, Phytologia 4: 63 (1952) and 5: 456. 1956; Moldenke, Résumé 142 & 477. 1959.

VITEX MADIENSIS var. GOSSWEILERI Pieper

Additional bibliography: Moldenke, Phytologia 5: 456--457. 1956; Moldenke, Résumé 146--148, 150, & 477. 1959.

VITEX MADIENSIS var. MILANJIENSIS (Britten) Pieper

Additional synonymy: Vitex madiensis ssp. milanjiensis (Britten) White, Forest Fl. North. Rhodesia 455. 1962.

Additional bibliography: Durand & Jacks., Ind. Kew. Suppl. 1, pr. 1, 457. 1906; Prain, Ind. Kew. Suppl. 5, pr. 1, 273. 1921; Durand & Jacks., Ind. Kew. Suppl. 1, pr. 2, 457. 1941; J. Hutchinson, Botanist in South. Afr. 501. 1946; Durand & Jacks., Ind. Kew. Suppl. 1, pr. 3, 457. 1959; Prain, Ind. Kew. Suppl. 5, pr. 2, 273. 1960; Moldenke, Phytologia 8: 44--45. 1961; White, Forest Fl. North. Rhodesia 455. 1962; Anon., Assoc. Etude Taxon. Fl. Afr. Trop. Index 1962: 63. 1963; Moldenke, Résumé Suppl. 12: 7. 1965; Moldenke, Phytologia 15: 258. 1967.

Recent collectors describe this plant as a subshrub, 50--80 cm. tall, a shrub 2--3 m. tall, or a small tree about 10 feet tall, many-stemmed, erect, with an irregular crown and arching stems with longitudinally fissured gray bark, the young stems greenish-purple; twigs sulcate, red-purple when young, gray- or brown-barked when older; leaflets bright-green and glossy above or pale-green, conspicuously bullate with impressed midrib and lateral veins, paler beneath with very prominent lateral veins and a whitish midrib, rigid, with undulate margins, peduncles and petioles dull-purple or purplish-brown; inflorescence axes dull-purple; calyx deep purplish-violet or deep violet-purple. On Brenan & Greenway 8059 the corollas are described as "white outside with violet tinge, inside lower lip lilac-violet, yellow at base, upper lip white; anthers blackish-violet; pollen white", while on their 8154 they are described as "lower lip of corolla violet with cream area at base, margins reflexed; lateral lobes white with faint violet tinge, upper lobes white; filaments white; anthers blackish-violet; style white; stigmas pale-green". Angolan collectors say "folhas de um verde claro. Frutos pequenos redondos.. Planta que surge aqui e ali am terrenos vermelhos da mata" and

"folhas verde ne parte superior, no verso amarelado. Flores creme amarelado roxo."

The variety has been found growing on the slopes of fixed sandhills with Hymenocardia, Vitex doniana, Hirtella bangweolensis, and Diospyros batocana, but not common, and in Brachystegia floribunda - Isoberlinia woodland with Triumfetta palmatiloba, Terminalia, Heeria, etc., at 1750 meters altitude, flowering in October. Hutchinson (1946) cites his no. 3704.

Material has been misidentified and distributed in herbaria as the typical form of V. madiensis Oliv.

Additional citations: ANGOLA: Huambo: Teixeira & Andrade 6656 (Ul); Teixeira & Sousa 6649 (Ul). Huila: Antunes or Dekindt 364 (Ul), s.n. [Mutyikavakai] (Ul); Gossweiler 13444 (Ul). NORTHERN RHODESIA: Brenan & Greenway 8059 (B), 8154 (B). PORTUGUESE EAST AFRICA: Manica e Sofala: Torre 6264 (Ul).

VITEX MADIENSIS var. NIVEA A. Chev.

Additional bibliography: Moldenke, *Phytologia* 5: 458. 1956; Moldenke, *Résumé* 140 & 477. 1959.

VITEX MADIENSIS var. SCHWEINFURTHII (Gürke) Pieper

Additional bibliography: K. Schum. in Just, Bot. Jahresber. 28 (1): 497. 1902; Thiselt.-Dyer, Ind. Kew. Suppl. 2: 194. 1904; Durand & Jacks., Ind. Kew. Suppl. 1, pr. 1, 457 (1906) and pr. 2, 457. 1941; Moldenke, *Phytologia* 5: 458--459. 1956; Moldenke, *Résumé* 134, 139, 142, 389, & 477. 1959; Durand & Jacks., Ind. Kew. Suppl. 1, pr. 3, 457. 1959.

VITEX MARANHANA Moldenke

Additional bibliography: Hill & Salisb., Ind. Kew. Suppl. 10: 244. 1947; Moldenke, *Phytologia* 5: 459--460. 1956; Moldenke, *Résumé* 111 & 477. 1959.

VITEX MARQUESII Pieper

Additional & emended bibliography: A. W. Hill, Ind. Kew. Suppl. 8: 249. 1933; Moldenke, *Phytologia* 5: 460. 1956; Moldenke, *Résumé* 148 & 477. 1959.

VITEX MARTII Moldenke

Additional bibliography: E. J. Salisb., Ind. Kew. Suppl. 11: 265. 1953; Moldenke, *Phytologia* 5: 460--461. 1956; Moldenke, *Résumé* 111 & 477. 1959.

VITEX MASONIANA Pittier

Additional bibliography: A. W. Hill, Ind. Kew. Suppl. 6: 219. 1926; Stapf, Ind. Lond. 6: 479. 1931; Moldenke, *Phytologia* 8: 45. 1961.

VITEX MEDUSAEALYX H. J. Lam

Additional bibliography: A. W. Hill, Ind. Kew. Suppl. 7: 252.

1929; Moldenke, *Phytologia* 5: 463. 1956; Moldenke, *Résumé* 188 & 477. 1959.

VITEX MEGAPOTAMICA (Spreng.) Moldenke

Additional synonymy: Vitex multinervis Schau. apud Jacks. in Hook. f. & Jacks., *Ind. Kew.*, pr. 1, 2: 1214. 1895. Vitex megapotamica (Spreng.) Moldenke ex Angely, *Bibl. Veg. Paran.* 196. 1964. Vitex montevidensis (Spreng.) Moldenke, *Résumé Suppl.* 15: 25, *sphalm.* 1967.

Additional & amended bibliography: Ettingsh., *Blatt-Skel. Di-* kot. 79, pl. 30, fig. 10. 1861; Jacks. in Hook. f. & Jacks., *Ind. Kew.*, pr. 1, 1: 297 & 304 (1893) and 2: 642 & 1214. 1895; A. W. Hill, *Ind. Kew. Suppl.* 6: 219. 1926; Herter, *Florul. Urug.* 106. 1930; Stapf, *Ind. Lond.* 6: 479. 1931; Jacks. in Hook. f. & Jacks., *Ind. Kew.*, pr. 2, 1: 297 & 304 (1946) and 2: 642 & 1214. 1946; Hill & Salisb., *Ind. Kew. Suppl.* 10: 244. 1947; Reitz, *Sellowia* 6: 249 & 257. 1954; Hocking, *Dict. Terms Pharmacog.* 243. 1955; Rambo, *Sellowia* 7: 207. 1956; Angely, *Fl. Paran.* 7: 13. 1957; Moldenke, *Phytologia* 6: 14 & 84. 1957; G. Taylor, *Ind. Kew. Suppl.* 12: 151. 1959; Reitz, *Sellowia* 11: 75 & 135. 1959; Jacks. in Hook. f. & Jacks., *Ind. Kew.*, pr. 3, 1: 297 & 304 (1960) and 2: 642 & 1214. 1960; Reitz, *Sellowia* 13: 110. 1961; Moldenke, *Phytologia* 8: 45. 1961; Rambo, *Pesquisas* 5, *Bot.* 12: 21. 1961; Lombardo, *Arbust. & Arbustil. Pas. Publ.* 43, 242, 260, & 314. 1961; Klein, *Pesquisas* 5, *Bot.* 14: 30. 1961; Klein, *Sellowia* 15: 45, 47, 50, & 51. 1963; Reitz & Klein, *Sellowia* 16: 41. 1964; Angely, *Bibl. Veg. Paran.* 196. 1964; Hänsel, Leuckert, Rimpler, & Schaaf, *Phytochem.* 4: 19--23, 26, & 27. 1965; Hänsel, Leuchert, Rimpler, & Schaaf, *Biol. Abstr.* 46: 7723. 1965; Cristiani, *Notas Divulg. Inst. Municip. Bot. Buenos Aires* 3: 104, 106, & 108. 1965; Rambo, *Pesquis. Bot.* 21: 56--57 & [60]. 1965; Moldenke, *Phytologia* 15: 78. 1967; Moldenke, *Résumé Suppl.* 15: 25. 1967.

Reitz & Klein (1964) describe this plant as follows: "Folhas opostas, digitadas, com 5 foliólos, 12 x 5--6 cm. Pseudo-umbelas com flôres azuladas ou brancas de corola irregular. Fruto drupa roxo-negra, esférica, 1 cm de diâm. Madeira para construção civil, obras hidráulicas e expostas, dormentes, esteios e moirões. Frutos mucilaginosos, comestíveis e medicinais, fornecem também óleo medicinal e servem também para pesca." Hocking (1955) says "lvs. with volat. oil with pinene, cineol, camphene; used as diur.; seed kernel with intox. alk.; taruma bark used medicinally".

Additional vernacular names recorded for this species are "cinco folhas" and "tarumán sin espinhas", as well as "horse chestnut" [a name normally applied to Aesculus hippocastanum in the Northern Hemisphere]. Hänsel, Leuchert, Rimpler, & Schaaf (1965) report that the chemical composition of V. megapotamica is "strikingly" different from that of four other species examined chemically by them. A letter to me from Dr. Hänsel, dated November 26, 1963, says: "Wir untersuchen seit mehreren Jahren Inhaltsbestandteile von Vitex Arten. Von phytochemischen Standpunkt aus gesehen fällt nun im Vergleich zu anderen europäischen Vitex Arten

die Spezies Vitex megapotamica Moldenke sehr aus dem Rahmen: Vitex megapotamica enthält praktisch keine ätherischen Öle und sie enthält keine lipophilen Flavonoide vom Typus des Casticins und sie enthält keine Pseudoindikane von Typus des Agnosids. Wir haben hingegen aus Vitex megapotamica Moldenke einigartige Tri-terpene isoliert."

Recent collectors describe this plant as a slender tree about 20 feet tall, the leaves sweet-scented, the fruit the color and size of a cherry, growing in forests and at forest margins, at altitudes of 70—600 m., flowering in November and December, and fruiting in March. The corollas on MacIntyre s.n. are described as "lavender and white".

The type specimen of V. montevidensis var. multinervis Cham., Sellow s.n., deposited in the herbarium of the Botanisches Museum at Berlin, was photographed there by Macbride as his type photograph number 17563, but is now destroyed; two cotypes of V. montevidensis Cham., Sellow 2355 & s.n., in the same herbarium, were photographed by him as his type photograph number 17561 and are now also destroyed.

Rosengurtt (1946) reduces Vitex montevidensis Spreng. to Lantana montevidensis (Spreng.) Briq., but this is entirely incorrect. The Lantana binomial is based on Lippia montevidensis Spreng. and has nothing to do with the Vitex montevidensis of Chamisso.

Rambo (1965) cites the following of his collections in the Herb. Anchieta: 448, 4813, 7839 [Theissen s.n.], 7842 [Theissen s.n.], 9214, 9216, 9572, 9965, 11263 [Puck s.n.], 11899 [Emrich s.n.], 25044 [Reckziegel s.n.], 25291 [Theissen s.n.], 25506 [Reitz s.n.], 27080, 27585 [Henz s.n.], 29358, 32667 [Henz s.n.], 32698 [Henz s.n.], 32908 [Friderichs s.n.], 34335 [Emrich s.n.], 34497 [Hatschbach 559], 35421 [Henz s.n.], 36965, 37993, 39236, 39819, 44520, 44611, 48069 [Sehnem 3516], 48629 [Sehnem 1441], 49156, 49270, 51795, 53149, 53210, 56210, 57379 [Camargo 49], 59126 [Pivetta 976], 60646 [Camargo 1415], 60739 [Freddiani s.n.], 61526 [Camargo 2622], 61542 [Camargo 2615], 61591 [Camargo 2697], 61731 [Camargo 2544], 62665 [Camargo 2372], 62853 [Camargo 3065], and 64048 [Sacco 440] from Rio Grande do Sul, and 55321 [Reitz 4699], 55671 [Reitz 5939], 58418 [Reitz 4610], and 58439 [Reitz 4653] from Santa Catarina, Brazil. He describes the plant as "a Middle to tall tree, up to 20 m high; sometimes a pigmy treelet on rocky outcrops or in the shifting sanddunes near the sea coast", found in "Dry woodlets, Campos copses, rain forest..... Throughout the whole of the forested area" in Rio Grande do Sul, with a general distribution "From Nibas Gerais to Paraguay, Misiones, RGS and Uruguay".

Additional citations: BRAZIL: Minas Gerais: Regnell I.38 (W—1706587). Paraná: E. A. Moreira 42 (W—2369335); Reiss 115 (Mí). Rio Grande do Sul: Herb. Inst. Pharmakog. s.n. (Fg); Rambo 37965

(W—2046855), 44611 (W—2026923), 49156 (Du—376540), 49270 (W—2055020), 51795 (W—2102205); Sehnen 3516 (B); Sellow 2355 [Macbride photos 17561, in part] (W—photo), s.n. [Brasilia; Macbride photos 17563] (W—photo), s.n. [Brasil. merid.; Macbride photos 17561, in part] (W—photo). Santa Catarina: Eq. Ecologia 106 (W—2027710), 151 (W—2027758); Reitz & Klein 7613 [Herb. Barb. Rodr. 22680] (N); Smith & Klein 13135 (Ac), 13222 (Ac), 14164 (Ac). PARAGUAY: Hassler 11417 (Mi); Pedersen 5222 (W—2432772). URUGUAY: Herter 1392 [Herb. Herter 88856] (W—1934709), 1392b [Herb. Herter 94042] (W—1934738); MacIntyre s.n. [Cunapiru Valley] (W—2369976).

VITEX MEGAPOTAMICA f. ALBIFLORA Moldenke

Bibliography: Moldenke, Biol. Abstr. 27: 2026. 1953; Moldenke, Phytologia 4: 183 (1953) and 5: 471. 1957; Moldenke, Résumé 111 & 477. 1959.

Klein describes this plant as a tree, 10 m. tall, growing at 30 m. altitude.

Additional citations: CULTIVATED: Brazil: Klein 2707 (W—2402932).

VITEX MEXIAE Moldenke

Additional bibliography: Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 2: 1213 (1895) and pr. 2, 2: 1213. 1946; A. W. Hill, Ind. Kew. Suppl. 10: 244. 1947; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 3, 2: 1213. 1960; Moldenke, Phytologia 8: 46. 1961.

VITEX MICRANTHA Gürke

Additional bibliography: Durand & Jacks., Ind. Kew. Suppl. 1, pr. 1, 457. 1906; A. W. Hill, Ind. Kew. Suppl. 6: 219. 1926; F. R. Irvine, Fl. Gold Coast 438. 1930; Cooper & Record, Yale Univ. Sch. Forest. Bull. 31: 117—118 & 153. 1931; Dalz., Useful Pl. W. Trop. Afr. 458. 1937; A. W. Hill, Ind. Kew. Suppl. 9: 297. 1938; Durand & Jacks., Ind. Kew. Suppl. 1, pr. 2, 457 (1941) and pr. 3, 457. 1959; Moldenke, Phytologia 8: 46. 1961; Huber in Hutchinson & Dalz., Fl. W. Trop. Afr., ed. 2, 2: 445 & 446. 1963; Kunkel, Willdenovia 3: 652. 1964.

Irvine (1930) describes this as a tree to 30 feet tall. Dalziel (1937) says "The wood is whitish or light yellow-brown, the sapwood and heart not differentiated, fairly light and of medium texture, taking a good polish. It furnishes a useful timber, used locally for light construction work, but liable to insect attack and decay. In Sierra Leone Koran boards are made of it. In Liberia the stem is hollowed out to make drums. Snakes are said to frequent the tree and to eat the fruit, accounting for the Liberian name ['sah-sah'], which means also a person with an evil reputation and maker of trouble (Cooper in Herb. Kew.). The leaves are applied to cure crawl-crawl." It has been collected in anthesis from February to May, and in fruit in February, April, June to August, and December. The vernacular name, "fevei", recorded for

this species, is applied also to V. oxycuspis J. G. Baker.

Huber (1963) describes this species as a "Forest tree, 15—80 ft. high, with fairly small, mostly 5-foliolate leaves and small white flowers, in poor, long-pedunculate cymes." He cites the following collections: GUINEA: Jacques-Félix 845. SIERRA LEONE: Aylmer 46, Deighton 658 & 3010, Mann 860 bis. LIBERIA: Baldwin 6114 & 10531, Barker 1230, G. P. Cooper 70, Linder 279. IVORY COAST: Aubréville 54, 907, & 1171; A. Chevalier 15409, 16229, & 17808; Schnell 6082. GHANA: Cummins 74, Irvine 2128, Kinloch FH. 3234, Kitson 1001, Vigne FH. 2798.

VITEX MICROPHYLLA Moldenke

Bibliography: Moldenke, *Phytologia* 3: 442—443. 1951; Moldenke in Humbert, *Fl. Madag.* 174: 72, 90—92, & 273, fig. 12 (5 & 6). 1956; G. Taylor, *Ind. Kew. Suppl.* 12: 151. 1959; Moldenke, *Résumé* 157 & 477. 1959.

Illustrations: Moldenke in Humbert, *Fl. Madag.* 174: 91, fig. 12 (5 & 6). 1956.

VITEX MILNEI Pieper

Additional bibliography: K. Schum. in Just, *Bot. Jahresber.* 28 (1): 497. 1902; A. W. Hill, *Ind. Kew. Suppl.* 8: 249. 1933; Hutchinson & Dalz., *Fl. W. Trop. Afr.*, ed. 1, 2: 276. 1937; Moldenke, *Phytologia* 5: 475. 1957; Moldenke, *Résumé* 138, 140, 382, 383, & 477. 1959; Huber in Hutchinson & Dalz., *Fl. W. Trop. Afr.*, ed. 2, 2: 448. 1963.

Huber (1963) includes in the synonymy of this species "V. cienkowskii of F. W. T. A., ed. 1, 2: 276, partly (syn. & Milne)." He comments that "Further material is required in order to decide the status of this plant. It differs from V. doniana in having a smaller calyx (2 mm. long) and a laxer inflorescence, and when better known it may prove to be recognisable as a distinct infraspecific taxon of that species." He claims that the Isert collection, cited by Pieper, is also from Togoland.

VITEX MOLLIS H.B.K.

Additional & emended synonymy: Vitex lasiophylla Benth., *Bot. Voy. Sulphur* 155. 1846. Vitex mollis Hook. & Arn. ex Benth., *Bot. Voy. Sulphur* 155, in syn. 1846. Vitex mollis Humb. & Kunth ex Benth., *Bot. Voy. Sulphur* 155. 1846.

Additional & emended bibliography: Benth., *Bot. Voy. Sulphur* 155. 1846; Bocq., *Adansonia* 3: [Rev. Verbenac.] 253. 1863; Jacks. in Hook. f. & Jacks., *Ind. Kew.*, pr. 1, 2: 1214. 1895; J. Ramirez, *An. Inst. Méd. Nac. Méx.* 2: 35—36. 1896; J. N. Rose, *Contrib. U. S. Nat. Herb.* 5: 223. 1899; Loes., *Verh. Bot. Ver. Brand.* 53: 81 [Abhandl. 246]. 1912; P. C. Standl., *Contrib. U. S. Nat. Herb.* 23: 1235 & 1236. 1924; A. W. Hill, *Ind. Kew. Suppl.* 7: 56 & 252. 1929; Stapf, *Ind. Lond.* 6: 479. 1931; H. B. Davis, *Life & Works Pringle* 174. 1936; Moreno Bello, *Med. Homeop. Mex.* 1 (3): 14—25. 1944; Jacks. in Hook. f. & Jacks., *Ind. Kew.*, pr. 2, 2: 1214. 1946; Mol-

denke, Phytologia 6: 81. 1957; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 3, 2: 1214. 1960; Moldenke, Phytologia 8: 46--47. 1961; Shelford, Ecol. N. Am. 448 & 607. 1963; Langman, Select. Guide Lit. Flow. Pl. Mex. 524, 607, & 1010. 1964; C. M. Rowell, Sida 1: 268. 1964; Moldenke in Shreve & Wiggins, Veg. & Fl. Son. Des. 2: 1261. 1964; Neal, In Gard. Hawaii, new rev. ed., 729 & 730. 1965.

In Shreve & Wiggins (1964) it is stated that this species grows "On dry or partly wooded hillsides, stream banks, in valleys and arroyos, along roadsides, and in the short-tree forest and lower margin of the oak forest, Sonoran to Tropical Zones, from central Baja California, Sonora, and Chihuahua to Oaxaca", Mexico. Gentry & Gilly found it "in oak forest on steep slopes of deeply dissected hills" in Sinaloa, and describe it as a tree, 4 m. tall, with a spreading crown, and trunk diameter of 15 cm. at breast height. Other collectors have found it in sandy alluvial soil at streamsides and among tall grass, trees, and shrubs in rocky loam soil in Guerrero; in woods and at streamsides in Nayarit; and in high dense forests dominated by Brosimum in Jalisco. Stange says that it is a "common tree in dry washes" in Jalisco.

Recent collectors describe the species as a shrub, 3 m. tall, or a slender tree, 6--10 m. tall, with a trunk diameter to 45 cm. at breast height, growing at the sides of arroyos, in Ipomoea matorral, or in the deciduous forest on ridges, subdeciduous in ravines, along with Trichilia, Hura, Jacaratia, Bursera simaruba, Tabebuia, and Brosimum. McVaugh refers to it as "occasional in disturbed woodland" in Michoacán and "occasional in tropical sub-deciduous forest" in Nayarit. The corollas are described as "purple" on Rzedowski 16695, "violet, edged paler" on McVaugh & Koelz 1526, "light purplish-blue" on R. McVaugh 23573, and "zygomorphic, lavender, lower lip marked purple, ridged in the throat" on R. McVaugh 22621. A note on Hinton 3384 says "flower white, previous collection had flower blue", so this may be representative of an as yet unnamed albino form of the species. This same collector notes that a "concoction" is "used for stomach ache".

Additional vernacular names are "coyotomate prieto", "gualamo", and "igualama". An isotype of V. hawaiiensis H. J. Lam is deposited in the herbarium of the Bishop Museum at Honolulu. The Bentham (1846) reference given in the bibliography of V. mollis is often dated "1844", but the page in question was not issued until the year 1846.

Material has been misidentified and distributed in herbaria as "Virex" pyramidata Robins. and as Sophora sp. On the other hand, the Cox & Guzmán MCC.631 and J. Rzedowski 15267, distributed as V. mollis, are actually V. pyramidata B. L. Robinson.

Additional citations: MEXICO: Chihuahua: Knobloch 527 (Mi), 901 (Id). Colima: A. R. Moldenke 1711 (Rf). Guerrero: Hinton 9970 (Rf), 9971 (Rf); Irby & Rowell 3515 (Mi); Rowell 3743 (Mi). Jalisco: Diquet s.n. (Mi); McVaugh & Koelz 1526 (Mi); Puga 22 (Mi); J. Rzedowski 15514 (Ip); Stange s.n. [23 March 1962] (Mi). México:

Hinton 3384 (Rf). Michoacán: R. McVaugh 22621 (Mi); J. Rzedowski 16695 (Ip, Mi, Ws). Nayarit: Feddema 1381 (Mi); R. McVaugh 23573 (Mi); A. R. Moldenke 1631 (Ac); Paray 2702 (Ip); J. Rzedowski 14280 (Ip). Oaxaca: E. J. Alexander 1033 (N, N); R. M. King 1259 (N). Puebla: Smith, Peterson, & Tejeda 3695 (N, W—2397739); S. S. White 5069 (Ip, Mi). Sinaloa: Gentry & Gilly 10642 (Rf); Herb. Inst. Politec. Nac. s.n. [San Ignacio, Junio 1945] (Ip). Sonora: Arguelles s.n. [San Bernardo, 12 Agosto 1958] (Rf). State undetermined: "X. A. 7" (N, N, N). CULTIVATED: Hawaiian Islands: H. M. Curran 127 (Bi); J. F. C. Rock 2690 (Bi); Woolford s.n. [June 22, 1949] (Bi).

VITEX MOMBASSAE Vatke

Additional bibliography: Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 2: 1214. 1895; K. Schum. in Just, Bot. Jahresber. 28 (1): 497. 1902; Thiselt.-Dyer, Ind. Kew. Suppl. 2: 194. 1904; Durand & Jacks., Ind. Kew. Suppl. 1, pr. 1, 457. 1906; Prain, Ind. Kew. Suppl. 5, pr. 1, 273. 1921; A. W. Hill, Ind. Kew. Suppl. 8: 249. 1933; Durand & Jacks., Ind. Kew. Suppl. 1, pr. 2, 457. 1941; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 2, 2: 1214. 1946; J. Hutchinson, Botanist in South. Afr. 487. 1946; Durand & Jacks., Ind. Kew. Suppl. 1, pr. 3, 457. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 3, 2: 1214. 1960; Prain, Ind. Kew. Suppl. 5, pr. 2, 273. 1960; Moldenke, Phytologia 8: 47. 1961; H. P. Riley, Fam. Flow. Pl. S. Afr. 129. 1963; Moldenke, Résumé Suppl. 12: 7. 1965.

Recent collectors describe this plant as a shrub, many-branched from the base, 1--2.5 m. tall, or a small tree, to 6 m. tall, spindly; bark gray, smooth; calyx pale-yellow; filaments rose. The corolla is described as "blue" on Barbosa 2359 and on R. Santos 237, "blue-lilac" on Barbosa 9549, "violet" on Torre 1070, "rose" on Torre 4562, and "with a violet-purple lip" on Mendonça 896. It has been found growing in forests or open forests of Brachystegia, open forests of Brachystegia spp. and Julbernardia globiflora, forests of Baikiaea plurijuga, in sandy soil, and on hillsides overlooking lakes. Bullock refers to it as "common" in Tanganyika, while Barbosa says "pouco abundante no local" in Angola. It has been found in flower and fruit in February and December. An additional vernacular name reported for it is "mucuvu".

A note attached to Barbosa 2359 states that this collection matches Hildebrandt 1972 and Wigg 517 in the herbarium of the British Museum. Hutchinson (1946) cites his no. 3342.

Additional citations: TANGANYIKA: Bullock 2372 (B); L. Thomas s.n. [12.11.1949] (B). ANGOLA: Huila: Antunes or Dekindt 467 (Ul), s.n. (Ul); Barbosa 9549 (Ul), 9714 (Ul); Gossweiler 12667 (Ul); C. Henriques 225 (Ul); E. J. Mendes 1625 (Ul), 1700 (Ul); R. Santos 237 (Ul); Torre 8641 (Ul). Mossamedes: Gossweiler

13442 (UL). RHODESIA: Lovemore 147 [Govt. Herb. Salisbury 35169] (N); Mullins 119/51 [Govt. Herb. Salisbury 35024] (N). PORTUGUESE EAST AFRICA: Cabo Delgado: F. A. Mendonça 896 (UL, UL); Torre & Paiva 9710 (UL). Manica e Sofala: Andrada 1245 (UL); Garcia 456 (UL), 788 (UL). Mozambique: Barbosa 2359 (UL); M. F. Correia 119 (UL); Gomes e Sousa 44 (UL), 848 (UL); Torre 900 (UL), 985 (UL), 1070 (UL). Tete: Torre 4562 (UL, UL). Zambezia: Torre 4786 (UL).

VITEX MOMBASSAE var. ACUMINATA Pieper

Additional bibliography: Moldenke, Phytologia 5: 483--484. 1957; Moldenke, Résumé 146 & 477. 1959.

VITEX MOMBASSAE var. ERYTHROCARPA (Gürke) Pieper

Additional bibliography: A. W. Hill, Ind. Kew. Suppl. 8: 249. 1933; Moldenke, Phytologia 5: 484. 1957; Moldenke, Résumé 148, 383, & 477. 1959.

VITEX MOMBASSAE var. PARVIFLORA (Gibbs) Pieper

Additional bibliography: Moldenke, Phytologia 5: 484. 1957; Moldenke, Résumé 149, 383, 386, & 477. 1959.

VITEX MONROVIANA Pieper

This taxon proves to be conspecific with V. phaeotricha Mildbr.

VITEX MOSSAMBICENSIS Gürke

Additional bibliography: Durand & Jacks., Ind. Kew. Suppl. 1, pr. 1, 457 (1906), pr. 2, 457 (1941), and pr. 3, 457. 1959; Moldenke, Phytologia 8: 64. 1961.

VITEX MOSSAMBICENSIS var. OLIGANTHA (J. G. Baker) Pieper

Additional bibliography: K. Schum. in Just, Bot. Jahresber. 28 (1): 497. 1902; Thiselet.-Dyer, Ind. Kew. Suppl. 4: 194. 1904; Moldenke, Phytologia 8: 64. 1961.

VITEX NEGUNDO L.

Additional synonymy: Agnus-castus negundo Carr. ex Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 1: 59, in syn. 1893. Vitex negundo L. ex B. Singh, Bull. Nat. Bot. Gard. 69: 57, sphalm. 1962. Vitex nigundo L. ex Moldenke, Résumé Suppl. 11: 8, in syn. 1964. Vitex trifolia Graham ex Chavan & Oza, Mahar. Savaj. Univ. Baroda Bot. Mem. 1: 187, in syn. 1966 [not V. trifolia Hemsl., 1949, nor L., 1753, nor L. f., 1923, nor Moon, 1895, nor Sessé & Moc., 1940, nor Vahl, 1946].

Additional & emended bibliography: L., Fl. Zeyl., ed. 1, 194--195 [genus 444]. 1747; W. Jones, Treat. Pl. Ind. 5: 136. 1790; Bocq., Adansonia 3: [Rev. Verbenac.] 253. 1863; Carr., Rev. Hort. 42--43: 445--446. 1871; Beddome, Forster's Man. Bot. S. Ind. 171. 1873; Boiss., Fl. Orient. 4: 535. 1875; Murray, Pl. & Drugs Sind 175. 1881; E. T. Atkinson, Him. Dist. Statist. Acct. NW. Prov. 10: 315 & 753. 1882; Aitch., Journ. Linn. Soc. Lond. Bot. 19: 182.

- 1882; Campbell & Watt, Descrip. Cat. Econom. Prod. Chutia Nagpur No. 8498. 1886; H. O. Forbes, Wand. Naturforsch. Malay. Arch. 2: 226. 1886; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 1: 59. 1893; W. A. Talbot, Syst. List Trees Shrubs Bomb. 161 & 229. 1894; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 2: 1213 & 1214. 1895; Lorimer, [Peshawar] Dist. Gazetteer 27. 1897-1898; Koord., Meded. Lands Plant-tuin Buitenz. 19: 560. 1898; J. L. Stewart, Punjab Fl. 166-167. 1899; Beissner, Schelle, & Zabel, Handb. Laubh. 426. 1903; E. D. Merr., Philip. Journ. Sci. Bot. 1, Suppl. 1: 121. 1906; Borm., Beih. Bot. Centralbl. 22 (2): 118. 1907; C. K. Schneid., Ill. Handb. Laubholz. 594-595. 1911; J. Matsumura, Ind. Pl. Jap. 2 (2): 534. 1912; Dunn & Tutchner, Kew Bull. Misc. Inf. Addit. Ser. 10: 204. 1912; E. D. Merr., Interpret. Rumph. Herb. Amboin. 453, 524, & 594. 1917; Bose, Man. Ind. Bot. 131 & 252. 1920; F. Miranda, Indiana For. 48: 596. 1922; Haines, Bot. Bihar & Orissa 4: 711 & 712. 1922; H. J. Lam in Bakh. & Lam., Nov. Guinea 14, Bot. 1: 169. 1924; H. J. Lam in Engl., Bot. Jahrb. 59: 27-28. 1924; Gamble, Fl. Madras 6: 1101 & 1102. 1924; L. H. Bailey, Man. Cult. Pl., ed. 1, pr. 1, 632 & 849 (1924) and pr. 2, 632 & 849. 1925; H. F. MacMillan, Trop. Plant. & Gard., ed. 1, 380 & 592. 1925; Sasaki, List Pl. Formos. 353. 1928; Stapf, Ind. Lond. 6: 478 & 479. 1931; P'ei, Sinensia 2: 70-71. 1932; Svenson, Brooklyn Bot. Gard. Record 22: 7. 1933; Kanehira, Fl. Micrones. 457. 1933; Tu, Chinese Bot. Dict., abrdg. ed., 462. 1933; Hand.-Mazz., Ann. Hort. Gothenb. 9: [67]-68. 1934; H. F. MacMillan, Trop. Plant. & Gard., ed. 4, 366 & 558. 1935; Ghose & Krishna, Journ. Indian Chem. Soc. 13: 634-640. 1936; Kanehira, Form. Trees, ed. 2, 652, fig. 607. 1936; Fletcher, Kew Bull. Misc. Inf. 1938: 431-433. 1938; L. H. Bailey, Man. Cult. Pl., ed. 1, pr. 3, 632 & 849. 1938; Corner, Gard. Bull. Str. Settl. 10: 256-259. 1939; Itakawa & Yamasita, Chem. Abstr. 1942: 36 & 7241. 1942; H. F. MacMillan, Trop. Plant. & Gard., ed. 5, pr. 1, 366 & 558. 1943; N. K. Basu, Indian Journ. Pharm. 6: 71-73. 1944; L. H. Bailey, Man. Cult. Pl., ed. 1, pr. 4, 632 & 849. 1944; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 2, 1: 59 (1946) and 2: 1213 & 1214. 1946; H. F. MacMillan, Trop. Plant. & Gard., ed. 5, pr. 2, 366 & 558. 1948; L. H. Bailey, Man. Cult. Pl., ed. 2, 843, 844, & 1114. 1949; W. J. Bean in Chittenden, Roy. Hort. Soc. Dict. Gard. 4: 2249 & 2250. 1951; Dastur, Useful Pl. India 221. 1952; Razi, Poona Univ. Journ. 1 (2): 47. 1952; Dastur, Med. Pl. India 347. 1952; V. S. Rao, Journ. Indian. Bot. Soc. 31: [297], 304-306, & 312-314, fig. 36-38. 1952; Moldenke in Humbert, Fl. Madag. 174: 71, 78-80, & 273, fig. 10 (3 & 4). 1956; Santapau, Fl. Purandhar 104 & 158. 1957; Moldenke, Phytologia 6: 14 & 21. 1957; Anon., U. S. Dept. Agr. Bot. Subj. Index 15: 14362. 1958; Karrer, Konstit. & Vork. Organ. Pflanzenst. 36, 356, & 358. 1958; Moldenke, Biol. Abst. 32: 1135. 1958; Anon., Biol. Abstr. 30: 4370. 1958; Anon., Kew. Bull. Gen. Index 1929-1956, 293. 1959; Sebastine, Bull. Bot. Surv. India 1: 95. 1959; Nayar, Bull. Bot. Surv. India 1: 124. 1959; Anon., Bull. Bot. Surv. India 2: 270-271. 1960; Kitamura, Fl. Afghan. 327. 1960; Nath, Bot. Surv. Shan States 304. 1960; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 3, 1: 59 (1960) and 2: 1213 & 1214. 1960.

NOTES ON NEW AND NOTEWORTHY PLANTS. XLVIII

Harold N. Moldenke

xCONGEA MUNIRI Moldenke, nom. nov.

Planta hybrida naturalis "C. connata Fletcher" et "C. chinensis Moldenke" intermedia bracteis 3 vel 4 supra albis.

The type of this hybrid was collected by Ch. d'Alleizette at Phau Rang, Annam, Vietnam, and is deposited in the Rijksherbarium at Leiden. Munir first described this plant in Gard. Bull. Singapore 31: 294 (1966) as "C. connata Fletcher (X ? C. chinensis Mold.)"

PREMNA FOETIDA var. PARVIFOLIA Moldenke, var. nov.

Haec varietas a forma typica specieⁱ recedit petiolis filiformibus ca. 1 cm. longis et laminis foliorum 2--4 cm. longis 1.5--2 cm. latis.

This variety differs from the typical form of the species in having its petioles filiform and only to 1 cm. long and the leaf-blades only 2--4 cm. long and 1.5--2 cm. wide.

The type of the variety was collected by H. S. McKee (no. 1999) on the stony slopes of Ouen Toro, altitude 0--50 meters, New Caledonia, on January 25, 1955, and is deposited in the United States National Herbarium at Washington.

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BOOK REVIEW

Alma L. Moldenke

"PLANTS: An Introduction to Modern Botany", second edition, by Victor A. Greulach & J. Edison Adams, xvi & 636 pp., illus. John Wiley & Sons, New York 10016, London, & Sydney. 1967. \$8.50

The first edition of 1962 could do little to inspire students starting this subject with a typical semester or quarter course, but this new edition has been updated at least a decade in all topics except taxonomy, in more effective illustrations, in more legible print, in the correcting of several errors, in superior presentation of several ideas and in enriched reference and appendix items.

This edition can be an effective teaching tool, as texts should be.

NEESIELLA - A NEW GENUS OF ACANTHACEAE

C.P.Sreemadhavan(Calcutta)¹

Andrographideae (Subfam. Ruelleoideae) contain a small number of genera confined to Tropical Asia. Bremekamp in 1948 (Verh. Nederl. Akad. Wet. (II) 45(2):20) and again in 1961 (Dansk. bot. ark. 20:77) has emphasised the need for a proper delimitation of the genera of this tribe. Materials are being collected for a monograph of this group, and a preliminary survey of available specimens and literature supports his view.

While studying materials of the genus Andrographis Wall. ex Nees, the consistently 4-seeded capsules of A. echio-
ides (Linn.) Nees prompted me to re-examine its taxonomic status. There is now convincing evidence to show that its inclusion in Andrographis is anomalous and hence it is made the type of a new genus. This new genus, Neesiella, is named after C.G.Nees von Esenbeck who had suspected the unnatural position of this species as early as 1832. His description (in Wall.Pl.As.Rar.3:117) runs as follows: 'Herbacea, hirsuta, foliis oblongis, subsessilibus, subcrenatis, racemis reflexis, capsulis tetraspermis. Genus probabiliter novum'. Neesiella is provisionally retained in Andrographideae.

Neesiella Sreem. gen. nov. pertinet ad Acanthaceas, Andrographideas, affinisque est Andrographidi Wall. ex Nees a qua differt calycis laciniis longioribus et persistentibus, polline maiore, capsulis minoribus ellipticis et semper 4-seminatis.

Herbae erectae, ramosae vel secus, culmis quadrangularibus. Folia opposita, sessilia vel subsessilia, oblonga, lanceata vel ovato-lanceata, sparse vel dense villosa in utraque pagina, cystolithis minutis. Flores in cymas axillares dispositi; bracteae parvae, lineares; bracteolae minutae; calyx 5-partitus, laciniis liberis fere usque ad basin, subaequalibus, elongatis sub fructu; corolla gibbosa, bilabiata, labio superiore minutim ad apicem bifido, labio inferiore trifido, alte purpureo intus; stamina 2; antherae barbatae; pollinis grana magna 3-colporata; ovarium bicellulare, ovulis binis in utraque cellula. Capsulae ellipticae, compressae, ad utrumque apicem acutae, seminibus 4, paulum compressis, rugose foveolatis, glabris.

¹The author is indebted to Dr.H.Santapau for translating the descriptions into Latin.

Typus: Neesiella echioides (Linn.) Sreem. Comb.nov. Justicia echioides Linn. Sp. Pl. 16, 1753. Andrographis echioides (Linn.) Nees in Wall. Pl. As. Rar. 3:117, 1832 & DC. Prod. 11:518, 1847 (pro parte); Clarke in Fl. Brit. India 4:505, 1884; Lindau in Engl. & Prantl, Pflanzenfamilien 4(3B): 323, 1895; Santapau in Mem. Univ. Bombay 2:51, 1951.

For the present I recognise two species: N. echioides (Linn.) Sreem. and N. longipedunculata Sreem. spec. nov. These are distinguished on the basis of leaf shape, nature and size of the peduncle and size of the fruiting calyx. Delimitation of specific and infraspecific taxa within this genus can be finalised only after a comprehensive study of a large number of representative specimens from as many localities as possible.

N. longipedunculata Sreem. spec.nov. affinis N. echioidi (Linn.) Sreem., a qua differt foliis lanceatis vel ovato-lanceatis, inflorescentia profuse ramosa et multo longiore, calyce persistente, quam capsula dimidio brevior.

Herba erecta, 20-40 cm alta, culmis quadrangulatis sulcatis, \pm glandularibus vel albo-pilosis. Folia 2-6 x 0.5-2 cm, opposita, sessilia vel subsessilia, lanceata vel ovato-lanceata, acuta vel subacuta ad apicem, obtusa vel subcordata ad basin, albovillosa in utraque pagina, cystolithis minutis aspersis in pagina superiore, nervis 5-7 jugis. Flores in cymas axillares ramosas dichasiales dispositi, 3-12 cm longi; bracteae lineares acutae dense glandulari-hispidae; bracteolae minutae; pedicellis brevissimis; calyce 5-partito, laciniis 3-5 x 0.75 mm, subaequalibus, ad basin fere liberis, intus glabris, extus glandulari-hispidis, in fructu elongatis; corolla 1-1.2 cm longa, gibbosa, bilabiata fere ad dimidium, intus pubescente, extus glandulari-hispida; labio superiore ovato, minutim bifido ad apicem, labio inferiore 3-lobo, lobo medio caeteris longiore, alte purpureo intus; stamina 2, filamenta sparse pilosa, antherae subcohaerentes, purpureae, dense albo-barbatae ad basin; ovarium bicellulare, ovulis binis in utraque cellula, stylo lineari, stigmate simplici. Capsulae 1-1.2 x 0.3-0.4 cm, ellipticae ad apicem, acutae sparse pilosae, seminibus 4, 2-3 x 1-1.5 mm, lateraliter paulum compressis, rugose foveolatis glabris.

Typus: India, Maharashtra, Nagpur, K. Subramanyam 4696A (Hoto typus in CAL) and K. Subramanyam 4696B-G (Iso-typi in MH).

STUDIES IN MANETTIA (RUBIACEAE)
SECTION HETEROCHLORA SCHUM.

In-Cho Chung, Chicago State College

This is the first of an anticipated series of five papers on the classification of the genus Manettia in the traditional four sections followed by a general discussion.

I recognize five species in sect. Heterochlora. The corolla is red, sometimes golden yellow towards the apex, bulbous or more commonly cylindrical, sometimes hypocrateriform, 13-25 mm. long, 2-5 mm. wide, usually densely pubescent outside, glabrous within except for a ring of hairs near the base. The disk is well developed and free from the calyx. Anthers are sessile and included. Stigmas are oblong and obtuse at the apex.

Key to Species

1. Corolla bulbous (9-15 mm. wide above the middle, 4-7 mm. wide at the base); calyx-lobes broadly ovate, 3-nerved.
N. Paraguay. M. rojasiana
1. Corolla usually cylindrical, sometimes hypocrateriform.
 2. Calyx-lobes linear-lanceolate, attenuate-acuminate, 10-15 mm. long, 1-nerved above the base, glabrous on both sides, ciliate. S. Brazil.
 3. Flowers solitary, or 2 or 3 on a very short (1-2 mm. long), peduncle in the axils; corolla fleshy, densely pubescent outside; free portion of stipules deltoid to lanceolate M. pedunculata
 3. Flowers 3-7 in cymelike inflorescences, or solitary in the leaf axils with long pedicels; corolla membranous, moderately to sparsely pubescent below and nearly glabrous above on the outside; free portion of stipules rounded. . M. campanulacea
2. Calyx-lobes broadly ovate, or when lanceolate, then short-acuminate, 5-10(13) mm. long, 3(-5)-nerved, pubescent on both sides.
 4. Flowers solitary, rarely two or three; calyx-lobes pubescent on both sides; capsules usually turbinate, mostly 7-10 mm. long; stipules merely glandular-toothed, devoid of cilia. S. Brazil and southeastward M. luteo-rubra
 4. Flowers few to many in umbels; calyx-lobes merely ciliate or pubescent on the lower side as well, glabrous or nearly so on the upper side; capsules usually subglobose, mostly 4-6 mm. long; stipules mostly ciliate as well as glandular-toothed, often aristate. Santo Domingo, Venezuela and Columbia M. calycosa

M. rojasiana Chod. & Hassl. Bull. Herb. Boiss. II. 4: 91.
1904. Syntypes: Hassler 5405, 8282. Figs. 1-5.

Branches herbaceous, subterate, more or less pubescent; free portion of stipules deltoid, acute, toothed, often reflexed; petioles 1-3 cm. long, pubescent; leaf blades membranous, ovate to ovate-lanceolate, acuminate to cuspidate at the apex, acute at the base, 5.5-10.5 cm. long, 3-4.3 cm. wide, glabrescent except the midrib and ciliate margins, with 4 or 5 lateral main veins on each side of the midrib, reticulum level with the surface; flower solitary; pedicels 4-7 cm. long, mostly exceeding the subtending leaf, densely pubescent; ovaries turbinate, about 4 mm. long, densely pubescent with white hairs; calyx-lobes 4, spreading, membranous, broadly ovate, 8-12 rarely 15-19 mm. long, 5-8 rarely 10 mm. wide, acute to acuminate, mostly 3-nerved, more or less pubescent on both surfaces, with short subulate interposed teeth; corolla fleshy, bulbous, 16-22 mm. long, 4-7 mm. wide at the base, 9-15 mm. wide above the middle, narrowed at the apex, 4-lobed, the lobes 1.5-2 mm. long, triangular, erect; outer surface of corolla densely covered with broad multicellular hairs, inner surface glabrous except for a ring of linear hairs near the base; anthers 6-7 mm. long, with the connective extending into an acute triangular apex, sessile, attached near the apex in short-styled flowers, attached near the middle in long-styled flowers; stigmas oblong, obtuse; disk free; capsules obovoid to turbinate, 7-12 mm. long, 6-8 mm. wide, moderately appressed pubescent.

Paraguay: Sierra de Maracayu: Hassler 5405 (BM, F, G, GH, K, MO, NY, S); upper River Apa: Hassler 8282 (BM, F, G, GH, K, MO, NY, P, S, UC, US); Sierra de Amambay, pr. Esperanza: Hassler 10269 (BM, G), 10527 (BM, F, G, K, MO, NY, S, UC); Alto Paraguay: Dept. San Pedro: Primavera: Woolston 1556 (K).

M. pedunculata (Spreng.) Schum. in Mart. Flor. Bras. 6(6): 173. 1889.

Var. pedunculata Figs. 6-13.

Diodia pedunculata Spreng. Syst. Veg. 1: 405. 1825.

M. pseudo-diodia Cham. & Schl. Linnaea 4: 174. 1829.

Type: Sellow. Sellow 326 (B) Photo!

M. pedunculata var. glabra Wernh. Journ. Bot. 57. Suppl. 22. 1919. Type: Miers 3310 (BM)!

Branches subtetragonal, glabrous; free portion of stipules deltoid to lanceolate, reflexed, toothed; petioles 1.7-2 cm. long, pubescent on the sulcate upper side; leaf-blades membranous, ovate-lanceolate, attenuate-acuminate at the apex, acute at the base, 10-12.5 cm. long, 3-3.7 cm. wide, glabrous except the ciliate margins, with 4 or 5 lateral veins on each side of the midrib, reticulum fine and level with the lower surface; flowers 1 to 3 in the axils; peduncles 1-2 mm. long; pedicels about 2.2 cm. long in flowers, 3-3.3 cm. long in fruit, glabrous,

with linear-lanceolate, ciliate bracts at the base; ovaries about 4 mm. long, turbinate, glabrous; calyx-lobes 4, linear-lanceolate, attenuate-acuminate, 1-nerved except the 3-nerved base, ciliate, 13-14 mm. long, erect; corolla fleshy, cylindrical, 20-22 mm. long, 4 mm. wide, densely covered with broad, short (1-2 celled) hairs or with slender multicellular hairs on the outside, glabrous within except for a ring of hairs 3-5 mm. above the base; anthers about 5 mm. long, sessile, attached near the middle of the tube in long-styled flowers; stigma oblong, obtuse; disk free; capsules subcompressed turbinate, about 10 mm. long, 5-6 mm. wide, glabrous.

Brazil: Rio de Janeiro: foot of Gavia, Miers 3310 (BM); Freire Allemao (G); Distrito Federal: Gericino: Brade 25015 (US).

M. pedunculata var. ciliata (Cham. & Schl.) Chung, comb. nov. Fig. 14. M. ciliata Cham. & Schl. Linnaea 4: 176. 1829. Type: Sellow (B) photo!

Differs from var. pedunculata in having: branches strongly tetragonal, densely ciliate on well-developed wings; pedicels, ovaries, and capsules densely pubescent to glabrous. Corolla 15-21 mm. long, densely covered with broad, short hairs or with slender multicellular hairs; calyx-lobes 10-14 mm. long.

Brazil: Rio de Janeiro: Parahyba, Riedel 23 (US); pr. Campos, Riedel 619 (BM, K -- in the envelope, P, US); Sao Paulo: Weir (K).

The specimen Riedel 619 (K) with leaves and capsules is distinct in that the whole plant is moderately pubescent. It is probably M. pedunculata contaminated by M. luteo-rubra.

Dusen briefly described a plant from Serra do Itatiaya, Brazil, collected by Ule, as M. pauciflora (Archiv Mus. Nac. Rio de Janeiro 13: 27. 1905), which is, according to his comparative description, somewhat intermediate between M. luteo-rubra and M. pedunculata. The above mentioned specimen, Riedel 619 (K), appears to be close to M. pauciflora Dusen.

Velloso's Guagnebina lutescens (Flor. Flum. 45, I. t. 116. 1825) was transferred to Manettia by Schumann (Mart. Fl. Bras. 6 (6): 186. 1889) with the suggestion that it might be referred to M. pedunculata. However, the short pedicels, short, ovate-lanceolate calyx-lobes, and glabrous corolla do not agree with those of M. pedunculata. (See note at the end of this paper)

M. campanulacea Standl. Field Mus. Bot. 8 (5): 327. 1931. Type: Saint-Hilaire B₁:42. Figs. 15-17.

This species may be distinguished from M. pedunculata var. ciliata (Cham. & Schl.) Chung mainly by: reflexed, toothed free

portion of stipules rounded; flowers mostly 3-7 in cymelike inflorescences, or solitary in leaf-axils with long pedicels; corolla membranous, sometimes widened at the apex, moderately to sparsely pubescent with broad, short hairs below, somewhat pubescent to nearly glabrous above on the outside, 15-17 mm. long.

Brazil: Minas Geraes: St. Gabriel: Saint-Hilaire B₁:42 (P, F); Sa. Julia: Glaziou 19435 (P).

M. luteo-rubra (Vell.) Benth. Linnaea 23: 445. 1850.

Var. luteo-rubra Figs. 18-36, 70.

Guanebina luteo-rubra Vell. Fl. Flum. 46. I.t. 121. 1825.

M. bicolor Paxton, Mag. Bot. 10 (1): 27, tab., 1843.

M. filicaulis Wawra, Oesterr. Bot. Zeitsch. 31: 281.

1881; Itin. Coburgi Bot. 1: 118, t. 17, 1883.

M. bradei Standl. Field Mus. Bot. 8 (5): 330. 1931.

Type: Brade 5281 (S)!

Branches subtetragonal, moderately pubescent; free portion of stipules deltoid to narrowly triangular, acute to acuminate, glandular-toothed, pubescent outside, mostly erect; petioles 5-7(12) mm. long, densely pubescent; leaf-blades usually somewhat thick, ovate to elliptic-lanceolate, acuminate at the apex, cuneate at the base, 4.5-6(11.5) cm. long, 2-2.5 (5.5) cm. wide, moderately pubescent on both sides, with 4 or 5 lateral main veins on each side of the midrib, reticulum level with the lower surface; flowers 1-3 in the axils; pedicels 10-15 mm. long in flower, 15-33 mm. long in fruit, densely pubescent; ovaries turbinate, 2-3 mm. long, densely pubescent; calyx-lobes 4, usually thickish, ascending to reflexed, ovate with narrowed base (5-10 mm. long, about 1.5 mm. wide at the base), acuminate at the apex, 3-nerved, densely pubescent, connate at the base for 0.5-1 mm., with minute teeth, usually devoid of lobules; corolla fleshy, cylindrical, 16-24 mm. long, 2-4 mm. wide, densely pubescent outside with broad 1-2 celled hairs and/or slender multicellular hairs, glabrous within except for a ring of hairs about 5 mm. above the base; anthers 3-3.5 mm. long, sessile, attached about 4 mm. below the apex of the tube in short-styled flowers, attached near the middle of the tube in long-styled flowers; stigmas oblong to linear-oblong, obtuse at the apex; disk free, conspicuous; capsules ellipsoidal to subcompressed turbinate, 6-9 mm. long, 4-5 mm. wide, densely pubescent.

Brazil: Minas Geraes: Caldas, Regnell I: 369 (F, K, S, US), Mosen 1342 (S), Lindberg 103 (S); Corinto, Mexia 5576 (BM, F, G, K, MO, NY, PH, S, UC, US); Serra do Curral, Mun. Nova Lima, Williams 6758 (F, GH, MO, NY, UC, US); between Mata and Serra do Curral, Mun. Belo Horizonte, Magalhaes 1943 (US); Km 50 between Bello Horizonte and Itabinito, Pereira & Pabst Herb. No. 98655 (F); Mun. Itabinito, Barreto 5297 (F),

Bello Horizonte, Barreto 3721 (F); Mun. Caete, Barreto 3715 (F); Itabira, Wedell anno 1844 (F); Cambuhy, in Vally of Rio Quebra, Angol, Dorsett, Shamel & Popinoe 1746 (US); Nova Ponte, Magalhaes 266 (F); Passa Quatro, Brade 18925 (NY); Claussen 688 (NY); Claussen March 1839 (G), Saint-Hilaire B₁ 1002 (P), Widgren anno 1845 (S).

Rio de Janeiro: Rio Pacahiba, Gardner 5739 (BM, K); Nova Friburgo, Dusen 1912 (S), C. Vianna Freire 290 (F); between Petropolis and Friburgo, Sandeman 2063 (K); between Ponte Nova and Valverde, Pabst 5352 (F); Serra dos Orgaos Rio dos Mortas, Brade 11454 (F).

Sao Paulo: Brade 5281 (S), 6814 (NY), Burchell 4688 (K), Mosen 1343 (S), Riedel 316 (K); Cotia, Constantino 112 (F); mun. Mairipora, Eiten & Eiten 1840 (US); Butantan, Hoehne 21 (F); Rio Claro, Loefgren 541 (F); Franca, Loefgren & Edwall 2067 (F); Mt. Jaragua, Bowie & Cunningham (BM), Gehrt April 1922 (F), Guillemin 401 (G); pr. Cantareira ab. urbe S. Paulo, Wettstein & Schiffner May 1901 (NY); Burchell 4688 (K); Usteri (K).

M. luteo-rubra var. paraguariensis (Chod.) Chung, comb. nov. Figs. 37-59, 71-73.

M. paraguariensis Chod. Bull. Herb. Boiss. 7. App. 1: 82. 1899. Type: Hassler 2511 (not seen).

M. bicolor Hook. f. Bot. Mag. 57: t. 7776. 1901.

M. inflata Sprague, Gard. Chron. 2: 385. t. 169. 1904. Type: Specimen of plant cultivated at Kew Gardens (K, P)!

M. samuelssoniana Standl. Field Mus. Bot. 8 (5): 330. 1931. Type: Lillieskold (S)! Fig. 73.

This may be distinguished from var. luteo-rubra usually by: slender petioles, thinner leaf-blades, slender, often elongated pedicels, membranous calyx-lobes, and acicular short calyx-lobules.

Free portion of stipules erect, or frequently reflexed; petioles mostly 10-25 mm. long; pedicels (15-) 25-50 mm. long in flower; calyx-lobes 4, usually membranous, mostly reflexed, ovate to ovate-lanceolate with narrowed base (7-13 mm. long, 2-5 mm. wide), or lanceolate (7-9 mm. long), 3-nerved, usually with acicular short (1-4 mm. long) interposed lobules; corolla 13-23 mm. long, 3-5 mm. wide, often inflated at the base, densely covered with slender multicellular hairs or rarely with broad 1- to several celled hairs outside; capsules 6-13 mm. long, 4-6 mm. wide.

Paraguay: near summit of Mt. Aroyo-Bostado, E. of Cordillera de Villa Rica, Balansa 2133 (G, K); R. Corrientes, Hassler 4502 (BM, G, GH, K, NY, P, S, UC); vic. Caaguazu, Hassler 8906 (BM, F, G, GH, K, NY, P, UC) SW base of Cordillera de Caaguazu, Dept. Caazapa, West 852 (UC); Caaguazu, Rojas 5042

(US); R. Alto Parana, Fiebrig 5416 (BM, G, GH, K, US); Colonia Presidente Gonzalez, Lindman A1847 (S); Villa Rica, Jorgensen 4311 (F, GH, MO, NY, PH, S, US), 7270 (F).

Uruguay: Salto, Gibert 728 (K)

Argentina: Misiones: Rio Uruguay, Sandeman 4819 (K);

Yguazu Falls, Osten 8200 (S); in distr. urb. Posadas, Lillies-kold s.n. (S); San Ignacio--Pastereo Grande, Moreau 21219 (F); Cataratas--Puerto Bemberg, Rodrigo 3688 (F); Santa Ana, Rodriguez 256 (F, P); Pto. Leon, Venturi June 26, 1909 (F); Rio Alto Parana, Zotta (F); Bonpland, Jorgensen 25 (F), Van de Venne Anno 1906 (F); Dept. Candelaria: Loreto Montes 2216 (F); Dept. Frontera Antonio, Krapovickas 2498 (F).

Brazil: Rio Grande do Sul: S. Leopoldo, Ritter 35521 (S); S. Angelo, Lindman A1069 (GH, S); Hamburgerberg, Malme 194 (F, S); Neu Wuerttemberg, Bornmuller 521 (GH); Sao Savador, Eugenio 2132 (F); pr. Caxias, Rambo 47193 (F).

Sta. Catharina: Ibirma, Smith & Klein 7530 (K, NY, US), Reitz & Klein 3446 (NY, UC, US), 3597 (US); Mun. Dionisio Cerqueira, Smith & Klein 11709 (US); Mun. Itapiranga, Smith, Klein & Schnorrenberg 11748 (US); Joinville, Reintz & Klein 4223 (NY, S, UC, US), 4662 (US); Lauro Mueller--Urussanga, Reitz & Klein 6863 (G, P, US); Rio do Sul, Reitz & Klein 6863 (NY, UC), 8244 (US), 8897 (K, US); Itajaby, Dusen 8401 (S).

Parana: Jaguarihyva, Hatschbach 3225 (US), Joenss 3042 (GH, MO, S); Serra do Mar, Dusen 3437 (F, S), 8622 (F, G, S, US), 9904 (GH, MO, S), Ponta Grossa, Dusen 7522 (S), 9911 (BM); Ypiranga, Reiss 91 (F, GH, NY); Curitiba, Gomes 5210 (US), Jessmann (US); Parque Nacional do Iguasu--Palmital, Duarte 1689 (F); Rio Taquaral, Hatschbach 2313 (US).

S. Paulo: Loefgren 43 (P).

Lindman A1069 (S) from S. Angelo, Rio Grande do Sul is interesting in that some flowers have six well-developed calyxlobes and 2 short (3-4 mm. long), slender, 1-nerved lobules

Dusen 8401 (S) from the coastal area of Itajahy, Santa Catharina has stout branches, thickish large leaves and 5-nerved calyxlobes as in Mueller 122 (K) which is the holotype of M. quinquenervia Sprague (Bull. Herb. Boiss II 5: 266. 1905). I believe that these two belong with M. luteo-rubra var. paraguar-iensis, Figs. 60-65.

M. calycosa Griseb. Fl. Brit. W. Ind. 330. 1861.

Type: Imray 65 (GOET). The corolla and the two capsules in the envelope should be the type. The branch with leaves and capsules is M. dominicensis Wernh.

Var. calycosa Figs. 66-69.

M. calycosa var. karsteniana Schum. Mart. Fl. Bras. 6 (6): 175. 1889. Syntypes: Fendler 5851, Funck & Schlim 1531, Schlim 891

M. calycosa var. latifolia Standl. Field Mus. Bot. 4 (8): 215. 1929. Type: Killip & Smith 20855 (US, isotypes GH, NY).

Branches slender with elongated internodes, subtetragonal to subterete, striate, glabrous to sparsely pubescent especially on the angles, free portion of stipules deltoid to setose, mostly erect, glandular-toothed and/or ciliate; petioles short, 3-5 mm. long, more or less pubescent; leaf blades ovate to ovate-lanceolate, cuspidate at the apex, rounded (rarely subcordate) to cuneate at the base, becoming subcoriaceous and somewhat wrinkled at maturity, slightly reflexed on the margins, glabrous except for the ciliate margins or somewhat hispid beneath especially on the veins, sometimes also somewhat scabrous above, variable in size, 3-8.5 cm. long, 2-4.4 cm. wide, with 3-4 lateral veins on each side of the midrib; flowers few to many in axillary umbels; peduncles nearly glabrous to densely pubescent, 2-10 mm. long; pedicels nearly glabrous to densely pubescent, 5-10 mm. long; ovary glabrous to densely pubescent; calyx-lobes 4, membranous, broadly ovate and acute at the apex to ovate-lanceolate and acuminate at the apex, 3(-5)-nerved, 4-7 mm. long, 2-3 mm. wide, glabrous on the inside, glabrous or sometimes with few hispid hairs on the outside, ciliate on the margins, devoid of calyx-lobules, connate at the base for about 0.3 mm.; corolla membranous, cylindrical or more frequently hypocrateriform, 15-25 mm. long, 3-4 mm. wide, somewhat pubescent to densely pubescent with slender multicellular hairs on the outside, glabrous within except for a ring of hairs 3-7 mm. above the base; anthers included, 3-4 mm. long, sessile, attached near the apex of corolla-tube in short-styled flowers, attached near the middle of the tube in long-styled flowers; stigmas oblong, obtuse; disk free; capsules mostly subglobose, 4-6 mm. long, rarely ellipsoidal-turbinate and 6-7 mm. long, glabrous to somewhat pubescent.

West Indies: Haiti: Imray 65 (GOET) the corolla and the two capsules in the envelope, excluding the branch with leaves and capsules; Santo Domingo: Schomburgk (K); Wright, Parry & Brummel 230 (US). Dominican Republic: Prov. La Vega, Vicinity of Piedra Blanca, 200-500 m, Allard 14207 (S, US); Distr. Sabaneta, Prov. Monte Cristy, banks of Río Cidra, 500-600 m, Valeur 572 (F, K, MO, S, US); Yuna River, Bonao, Augusto 765 (NY), Bonao-Yuna (jungle), Augusto 1380 (GH, NY).

Venezuela: Valley of Pto. La Cruz, El Limon: Jahn 1321 (US), Pittier 9215 (G, GH, NY, US); Caracas: Birschel (K), Funck 438 (G, P), Funck & Schlim 153 (BM, G, P), Kuntze 1275 (NY), Pittier 9934 (G, GH, NY, US), van Landsberge 381 (S), 389 (S); Miranda: Allart 218 (NY, US), Pittier 218 (G), 5971 (US), 7082 (GH, US), 13051 (F, G, NY, US); Aragua: Gines 4136 (US), Killip & Lasser 37764 (US), Steyermark & Farinas 91438 (NY), Williams, Ll. 10458 (F), 10738 (F); Carabobo: Williams Ll. 10991 (F, GH); Zulia: Gines 2042 (US), Bernardi 3175 (NY); Tachira: Steyermark 57139 (F, GH); Río Claro: Saer (F); San Pablo de Mendoza: Pittier 10746 (G, GH, NY, US); between Río

Taquasito and slopes of Morro de Aguaramal, Steyermark 2001 (NY); Merida: Bernardi anno 1956 (NY); Tovar: Fendler 588 (G, GH, K, MO, NY, PH), Ernst 431 (BM), Moritz 34 (BM), Williams, Ll. 10765 (F).

Columbia: Santa Marta: Funck 417 (K), Smith 1392 (BM, F, G, GH, MO, NY, P, PH, US); Norte de Santander: Cuatrecasas 12230 (US), 13408 (US), Fosberg 21739 (P, US), Kalbreyer 360 (K), Schlim 89 (BM, G, K, P); Cundinamarca: Grant & Fosberg 9376 (P, UC, US), Pennell 1785 (NY), 1858 (NY, US); Magdalena: Apo-luiai 513 (F), Cuatrecasas & Romeo 24321 (US), Giacometto 59 (US); Boyaca: Lawrence 404 (BM, GH, MO, S).

M. calycosa var. scaberrima (Wernh.) Chung, comb. nov.

M. scaberrima Wernh. Journ. Bot. 57 Suppl. 24. 1919.

Syntypes: Linden 895, Triana 142.

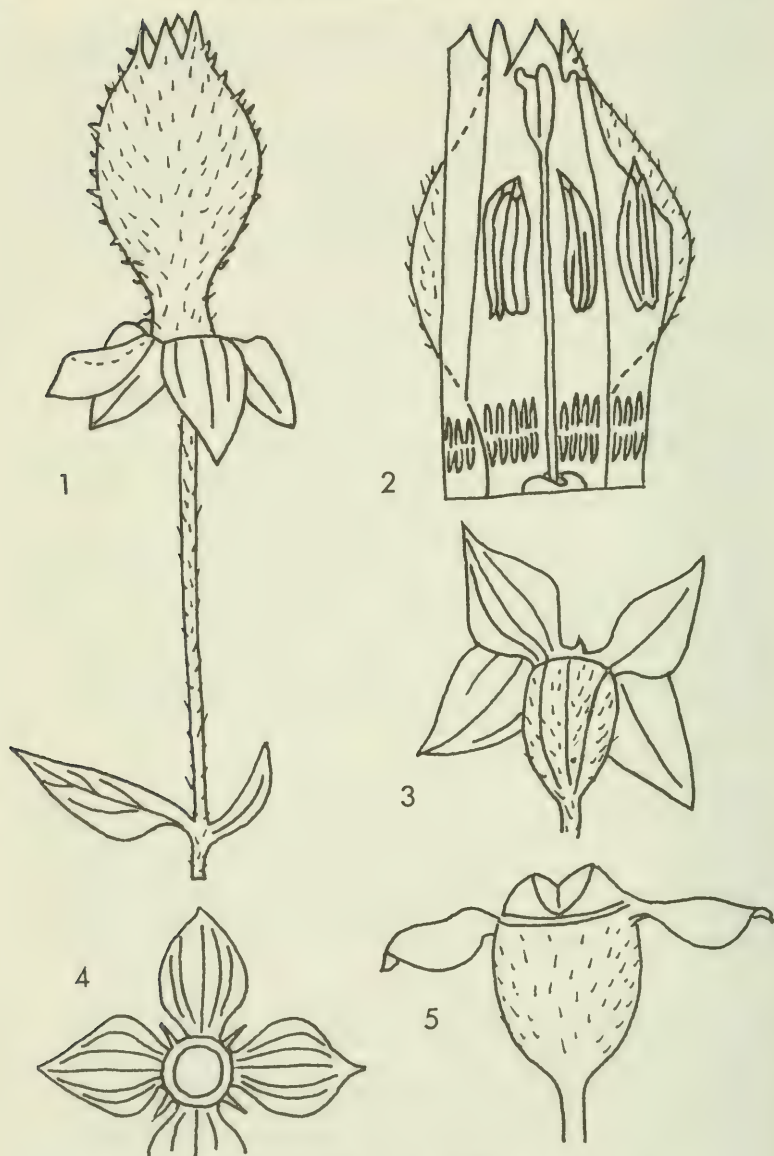
M. holtonii Wernh. l.c. 23. 1919. Type: Holton 606.

Distinguished from var. calycosa by: the densely hispid abaxial side of calyx-lobes and of leaf-blades; the upper side of leaf-blades frequently scabrous; young branches, peduncles, pedicels, ovaries, and capsules usually pubescent.

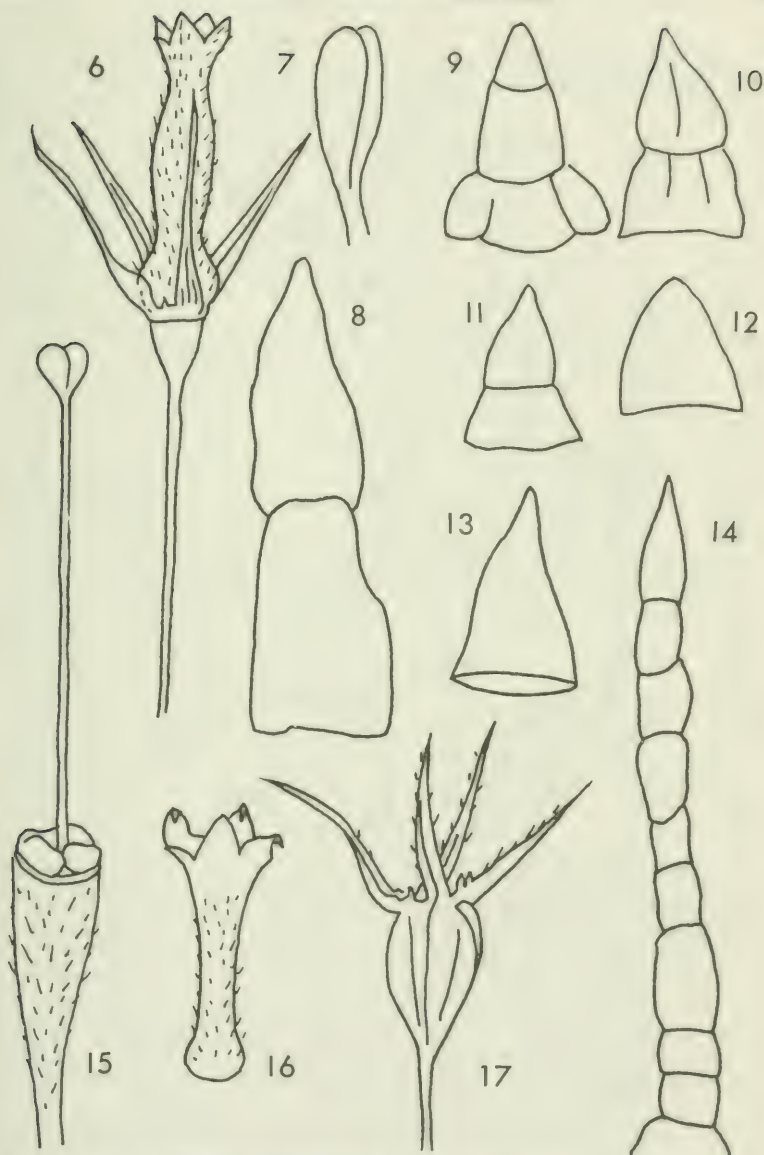
Columbia: Dept. Antioquia: Daniel 2215 (US), Hodge 6948 (US); Dept. Caldas: Salamina: Tomas 1856 (US), Medellin: Toro 409 (NY), 825 (NY), 897 (NY), Tracy 379 (K); Dept. Cundinamarca: Garcia 7675 (US), 11850 (US), 12330 (F, US); Ibague: Andre K558 (K), Goudot 1 (K); Prov. Marquita: Ibague: Linden 895 (BM, G), La Palmilla: Triana 142 (BM, P); Dept. Tolima: Killip & Hazen 9604 (GH, K, NY, PH, US), Pennell 3432 (GH, MO, NY); Dept. El Valle: Cuatrecasas 22630 (F); Pennell, Killip & Hazen 8557 (NY, PH); Dept. Cauca: Holton 606 (G, GH, K, NY, PH, UC), Lehmann 7216 (K).

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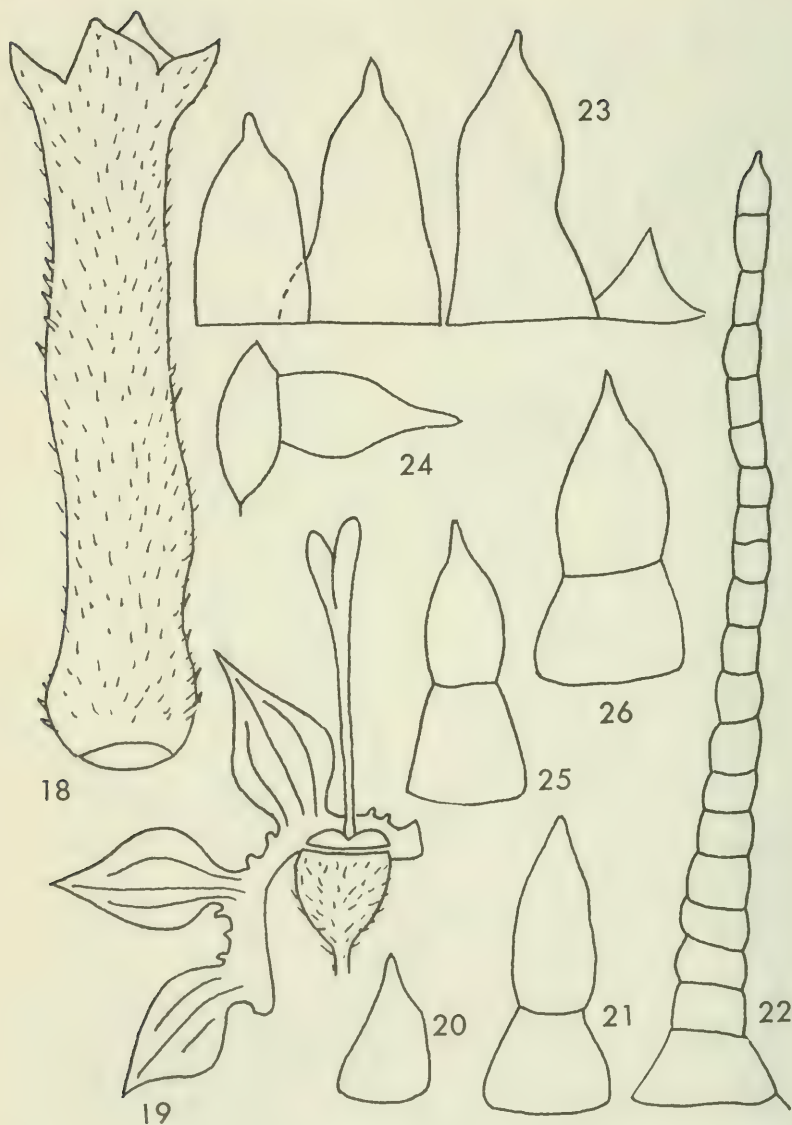
Note on Guagnebina lutescens Vell. The glabrousness of the corolla of M. lutescens (Vell.) Schum. does not agree with M. luteo-rubra (Vell.) Benth. or var. paraguariensis (Chod.) Chung (M. inflata Sprague), although its identity with the latter was suggested by Wernham (1919). Within the limits of the specimens I have studied, the northern limit of the range of M. luteo-rubra var. paraguariensis is Sao Paulo.



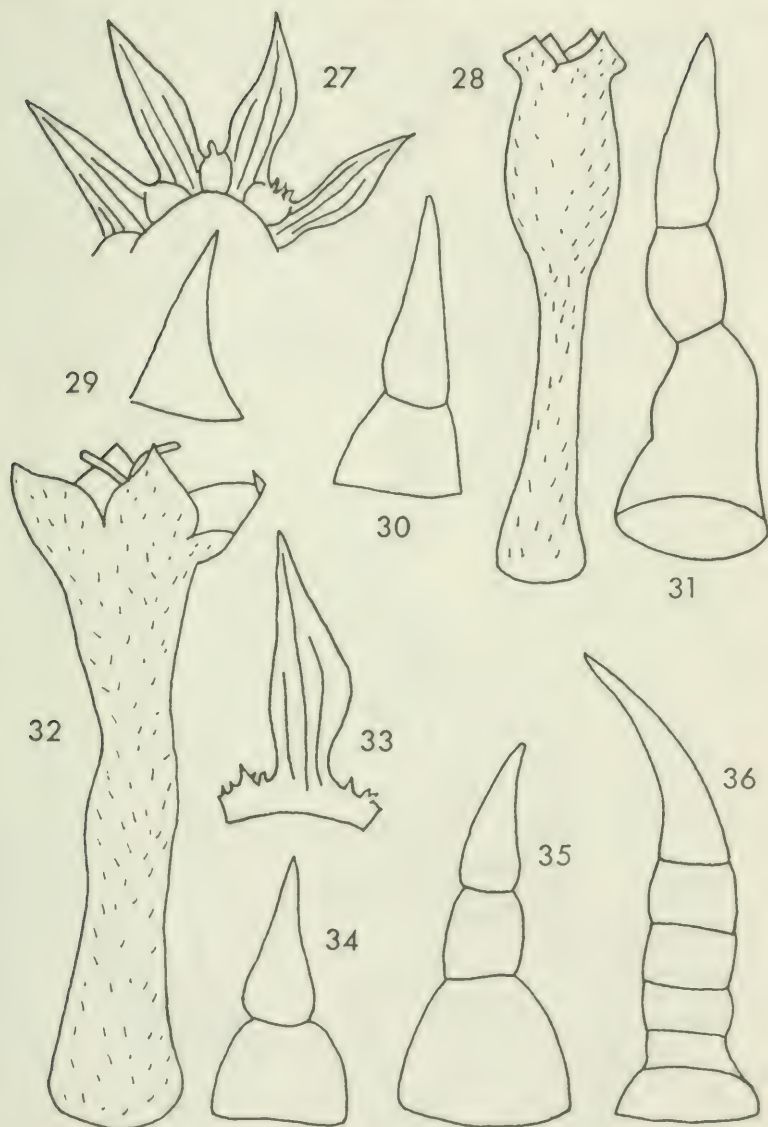
Figs. 1-5. *Manettia rojasiana*. 1. Flower, x2 (Hassler 5405, G). 2. Corolla, opened, x3 (Hassler 5405, G). 3. Ovary and calyx-lobes, x2 (Hassler 5405, MO). 4. Calyx-lobes and lobules, x2 (Hassler 10527, G). 5. Capsule, x2 (Hassler 10527, MO).



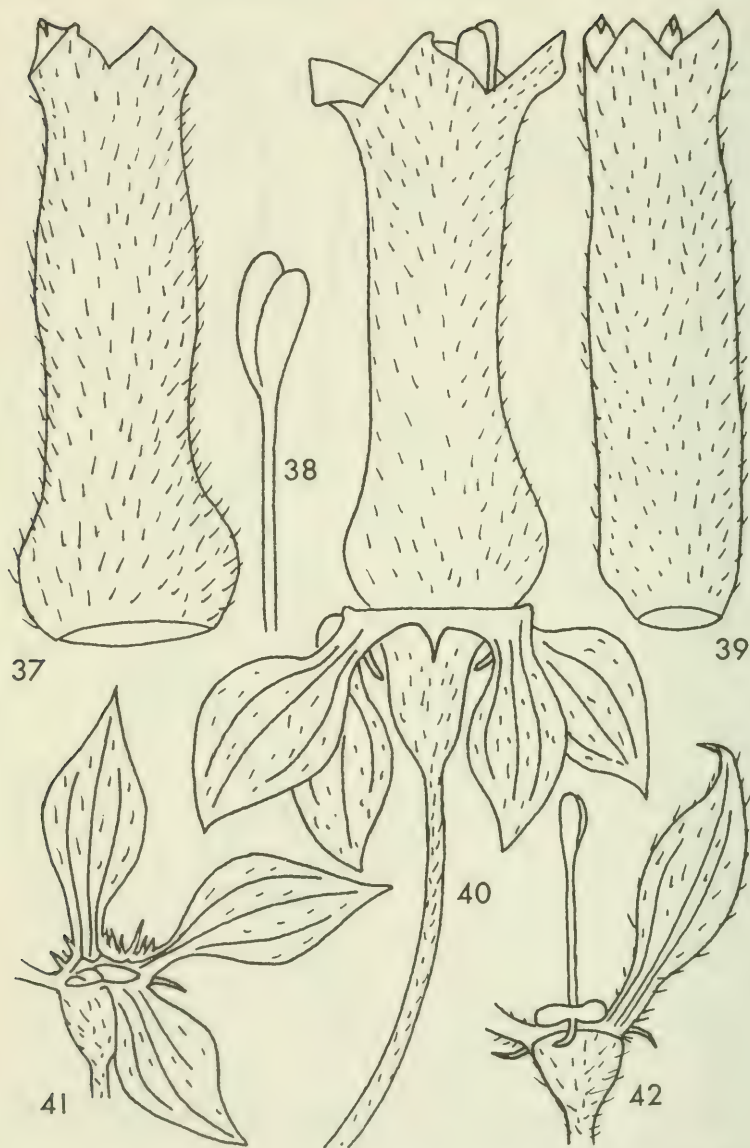
Figs. 6-13. Manettia pedunculata var. pedunculata (Freire Allemo, G). 6. Flower, x2. 7. Stigmas. 8. Hair from lower part of corolla, x100. 9-13. Hairs from upper part of corolla, x100. Fig. 14. Hair from lower part of corolla, x100, M. pedunculata var. ciliata (Riedel 619, BM). Figs. 15-17. M. campanulacea (Saint-Hilaire B1:42, P). 15. Pistil, x5. 16. Corolla, x2. 17. Ovary and calyx-lobes, x2.



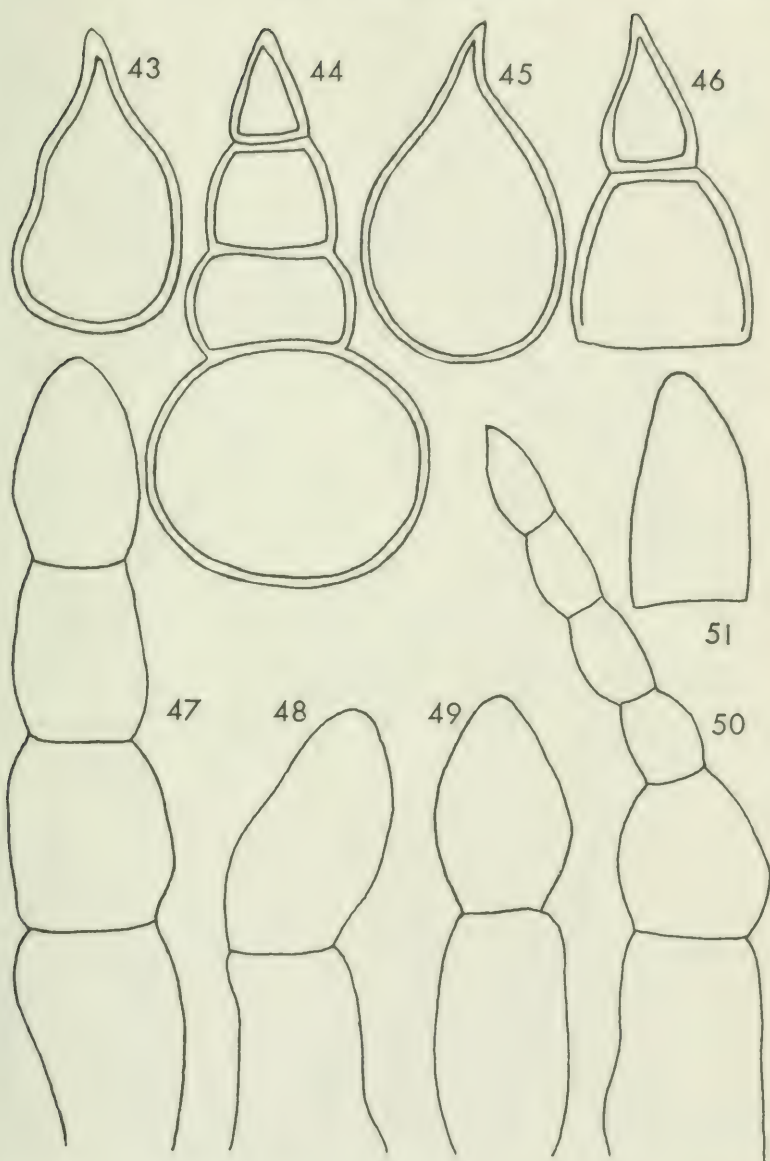
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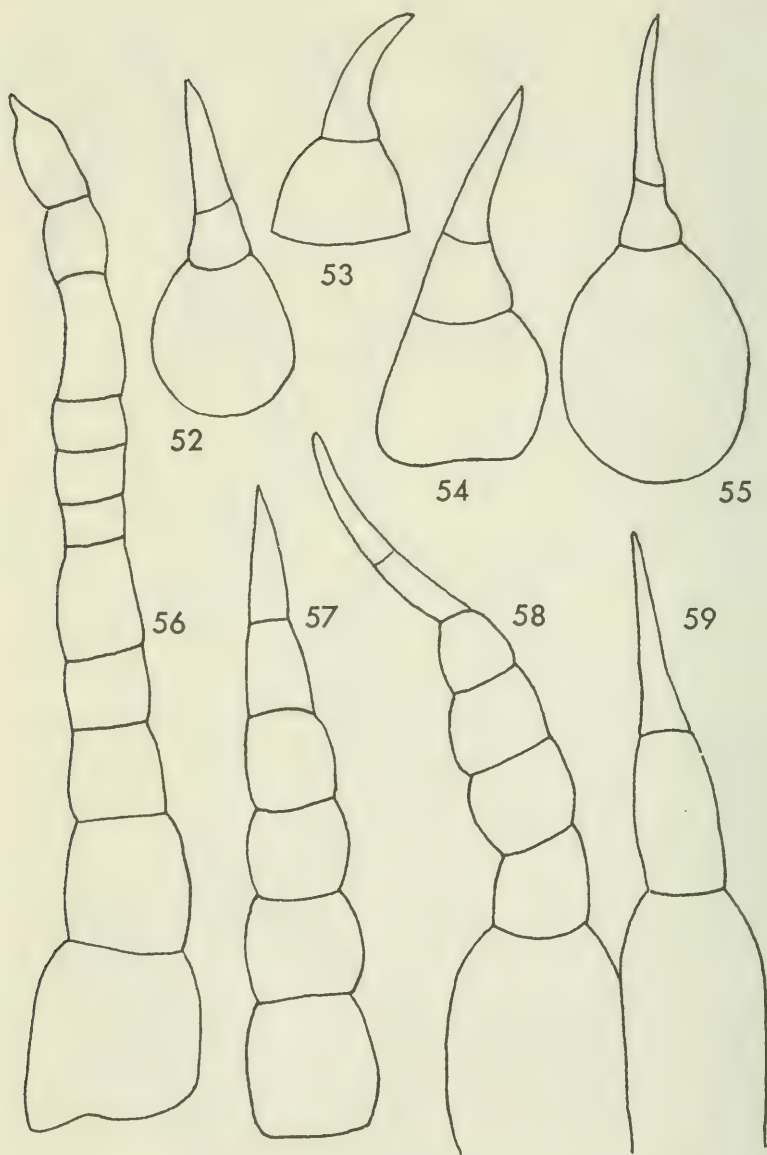
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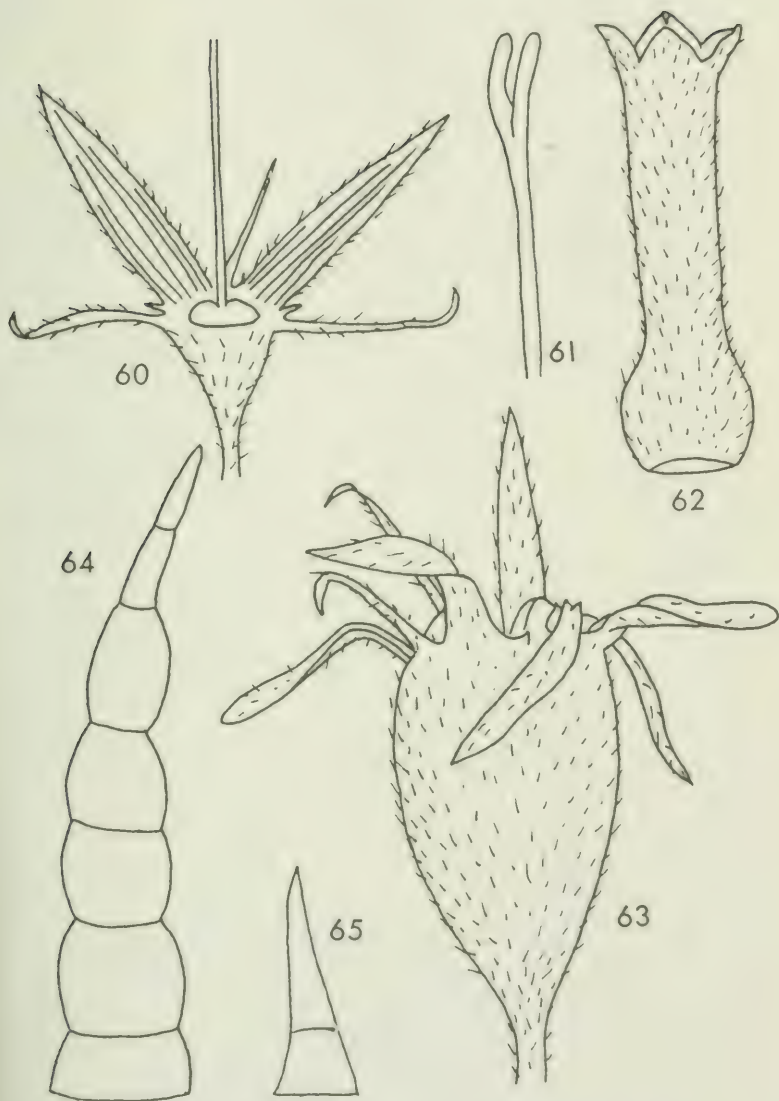
Figs. 37-42. *Manettia luteo-rubra* var. *paraguariensis*, x4, 37-38. From short-styled flower (Hassler 4502, NY). 39. Corolla of short-styled flower (Hassler 4502, P). 40. Long-styled flower (Gibert 728, K). 41. From Hassler 8906 (NY). 42. From Dusen 7522 (S).



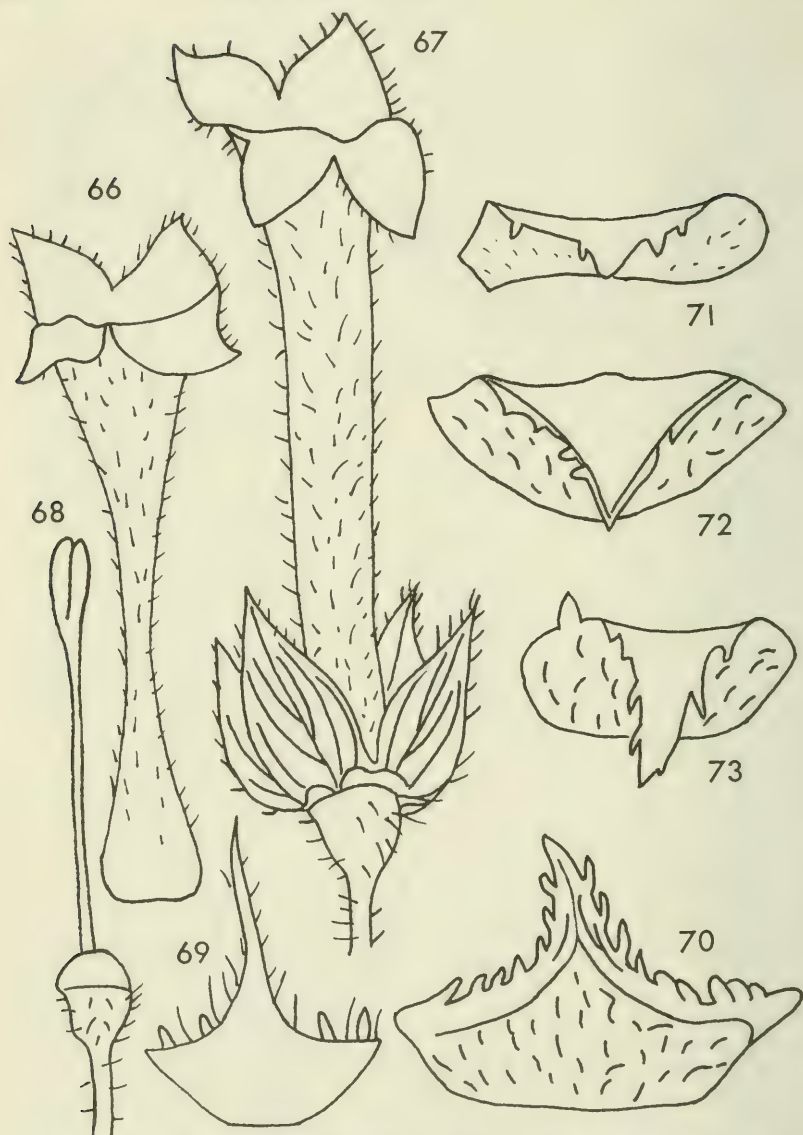
Figs. 43-51. Manettia luteo-rubra var. paraguariensis (Gibert 728, K), x100. 43-46. Hairs of corolla-lobes. 47-51. Hairs of corolla-tube.



Figs. 52-59. *Manettia luteo-rubra* var. *paraguariensis* (Hassler 4502, NY), x100. 52-55. Hairs of corolla-lobes. 56-59. Hairs of corolla-tube.



Figs. 60-65. Manettia quinquenervia (Mueller 122, K). 60. x4. 61. x10. 62-63. x4. 64. Hair of corolla-tube, x100. 65. Hair of corolla-lobes, x100.



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OXYRHYNCHUS AND MONOPLEGMA (LEGUMINOSAE)

Velva E. Rudd

In the course of identifying my two collections of Oxyrhynchus from Mexico I noted that very similar material could be found in several places in the herbarium, in folders of Oxyrhynchus, Dolichos, Monoplegma, Dioclea, Peckelia, Phaseolus, and Vigna, not to mention the "indeterminatæ." In some cases nomenclatural synonymy was involved, in others, taxonomic.

The similarity of Monoplegma, with one species, originally described as a Dioclea, and Oxyrhynchus, currently with three species, one of which was first placed in Dolichos, is striking, and I believe should be synonymous, as indicated in the following treatment. The mixture of characters, with some similarities to Phaseolus and Vigna as well as to other segregate genera of those two, suggests an interesting ancestry for Oxyrhynchus. Perhaps it should not be separated from Vigna. Wherever they are placed, however, I think the two following species should be together.

Because the taxa are not generally well known I am presenting a key, descriptions, and citations in the hope that more material will be found and further studies made. For the illustrations I am indebted to Kate Miller, an undergraduate research assistant in the 1967 summer program at the Smithsonian Institution.

OXYRHYNCHUS Brandege, Univ. Calif. Publ. Bot. 4: 270. 1912.

Type: O. volubilis Brandege. Mexico.

Monoplegma Piper, Journ. Wash. Acad. Sci. 10: 432. 1920.

Type: M. sphaerospermum Piper. Costa Rica.

Herbaceous or lignescent vines; leaves pinnately trifoliolate; leaflets trinerved at the base, otherwise pinnately nerved; stipules and stipels small, striate, attached at the base; inflorescences racemose with swollen glandular peduncles; bracts striate, attached at the base or the bracteoles sometimes subpeltate; flowers papilionaceous; calyx campanulate with 5 subequal lobes; petals greenish yellow to purplish, the standard glabrous on the outer face, slightly longer than the wings and keel, the keel petals joined, rostrate; stamens diadelphous α 1; style curved, glabrous at the base, bearded toward the apex, laterally as well as at the base of the stigma, the stigma elongate or subcapitate, terminal or subterminal; fruit bivalved, dehiscent; seeds spherical or subspherical, sublustrous, black to blackish-brown with a white, linear, cushioned hilum; germination hypogeal.

Key to species of *Oxyrhynchus*

Terminal leaflet ovate, acute; flowers 9-10 mm. long; calyx 3-5 mm. long; fruit pubescent, 4-6 cm. long, 2-3 cm. broad; seed 10-15 mm. long, 10-14 mm. in diameter, the hilum extending over half the circumference of the seed (Texas; Mexico; Cuba; Bahamas) 1. *O. volubilis*

Terminal leaflet elliptic, acuminate; flowers 10-15 mm. long; calyx 5-6 mm. long; fruit glabrate, 7-10 cm. long, 3.2-4 cm. broad; seed 18-20 mm. long, 13-17 mm. in diameter, the hilum extending about 2/3 the circumference of the seed (Mexico; Guatemala; Costa Rica; Colombia) 2. *O. trinervius*

1. *OXYRHYNCHUS VOLUBILIS* Brandege, Univ. Calif. Publ. Bot. 4: 271. 1912. Type: C. A. Purpus 5281. Mexico.
Dolichos insularis Britton, in Britton & Millspaugh, Bahama Flora 195. 1920. Type: J. A. Shafer 1026. Cuba.
Oxyrhynchus insularis (Britton) Piper, Journ. Wash. Acad. Sci. 14: 48. 1924.
Oxyrhynchus alienus Piper, Journ. Wash. Acad. Sci. 14: 47. 1924. Type: M. E. Woodbridge s.n. Texas.

Herbaceous vine; leaflets ovate to subhastate, the laterals oblique, acute, rounded at the base, the surfaces sparsely appressed-pubescent, glabrescent; stipules deltoid, 3-4 mm. long, 1-1.5 mm. wide; stipels linear-deltoid, about 2-3.5 mm. long, 1 mm. wide or less; bracts linear, caducous; bracteoles ovate-elliptic, sometimes caducous; flowers 9-10 mm. long; calyx 3-5 mm. long, ciliate, otherwise glabrous without, sericeous within, the lobes rounded, about as long as the tube; fruit with valves thinly coriaceous or chartaceous, puberulent, commonly 2- or 3-seeded, 4-6 cm. long, 2-3 cm. broad, 1-2 cm. thick; seed 10-15 mm. long, 10-14 mm. in diameter, the hilum 1-1.5 mm. wide, 15-20 mm. long, extending over half the circumference of the seed.

Distribution: Texas, eastern Mexico, Cuba, and the Bahamas.

UNITED STATES:

Texas: Austin, Woodbridge s.n., Oct. 3, 1921 (US), Oct. 28, 1921 (US), Nov. 1921 (US), Dec. 1921 (US), May 1922 (US), Sept. 13, 1923 (GH, US type of *O. alienus*); Piper s.n., Aug. 13, 1923 (NY).

MEXICO:

Nuevo León: Monterrey, Pringle 11333 (GH, MICH, US).

Tamaulipas: Victoria, Berlandier 3129 (GH); Palmer 265 in 1907 (GH, NY, US); Runyon s.n., Mar. 23, 1925 (US). Jaumave, Viereck 683 (US). Between Victoria and Jaumave, Johnston & Graham 4139 (MICH).

San Luis Potosí: Minas de San Rafael, Rascón, Purpus 5281 (GH, US, isotypes of O. volubilis). Between Tamuín and Ebano, plantation of the Estación Forestal Experimental de la Fábrica Fibracel, Rudd 1072 (US), 1073 (US).

WEST INDIES:

Bahamas: Abaco, Brace 1757 (US fragment).

Cuba: Camagüey: La Gloria, Shafer 255 (US). Cayo Ballenato Grande, Shafer 1026 (NY type of D. insularis, US).

Local name: Frijol monilla (Mexico).

The seeds are used as food and the beans as marbles, according to Palmer (no. 265).

In comparing type material of the three taxa previously placed in Oxyrhynchus I can see no reason for maintaining them as separate species.

2. OXYRHYNCHUS TRINERVIUS (Donn. Sm.) Rudd, comb. nov.

Dioclea trinervia Donn. Sm. Bot. Gaz. 56: 53. 1913.

Type: O. F. Cook & R. F. Griggs 140. Guatemala.

Monoplegma sphaerospermum Piper, Journ. Wash. Acad. Sci. 10: 433. 1920. Type: A. Tonduz 12743. Costa Rica.

Monoplegma trinervium (Donn. Sm.) Piper, Contr. U. S. Nat. Herb. 22: 664. 1926.

Herbaceous or lignescent vine; leaflets elliptic (terminal) or obliquely ovate (laterals) acuminate, rounded at the base, the surfaces sparsely appressed-pubescent, glabrescent; stipules deltoid, 2-4 mm. long, 1-2 mm. broad at the base; stipels oblong to deltoid, 2-4 mm. long; bracts broadly ovate, attached at the base, the bracteoles broadly ovate to orbicular, sometimes extended below the point of attachment; flowers 10-15 mm. long; calyx 5-6 mm. long, ciliate, otherwise glabrous without, sericeous within, the lobes rounded, about as long as the tube; fruit with valves coriaceous, subsericeous when young, essentially glabrous at maturity, 1-4-seeded, 7-10 cm. long, 3.2-4 cm. broad, 1-2 cm. thick; seed 18-20 mm. long, 13-17 mm. in diameter, the hilum about 1.5 mm. wide, 30-35 mm. long, extending about 2/3 the circumference of the seed.

Distribution: Known from southern Mexico, Guatemala, Costa Rica, and western Colombia.

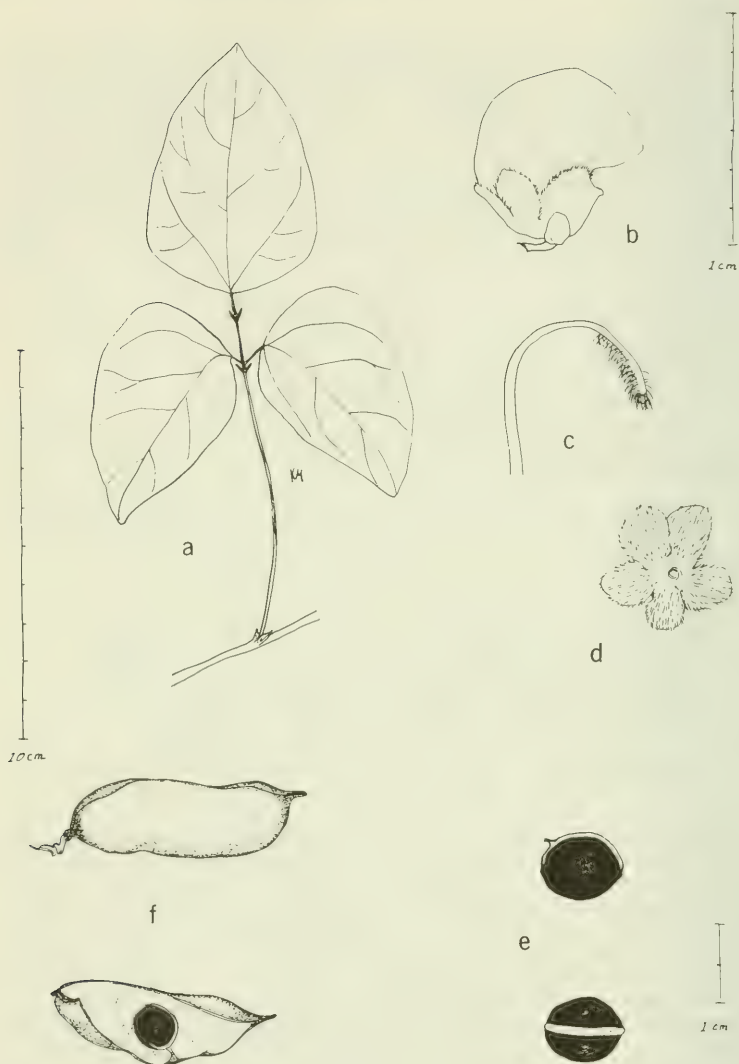


Fig. 1 - *Oxyrhynchus volubilis*: a, leaf; b, unopened flower; c, style and stigma; d, interior of calyx; e, seeds; f, fruit.



Fig. 2 - *Oxyrhynchus trinervius*: a, leaf; b, unopened flower; c, style and stigma; d, seeds; e, fruit.

MEXICO:

Veracruz: Río Coscuapam, Los Tuxtlas, Sousa 2916 (MEXU, US).

GUATEMALA:

Alta Verapaz: Near Finca Sepacuite, Cook & Griggs 140 (US type of D. trinervia).

Baja Verapaz: Panzal, von Tuerckheim 3909 (US).

COSTA RICA:

Puntarenas: Barú, Pittier /Herb. Inst. Cost. no. 7/ 11958 (US).

San José: El General, Skutch 2738 (GH, MICH, NY, US). Las Vueltos, Tucurrique, Tonduz /Herb. Inst. Cost. no. 7/ 11450 (US), 12743 (US type of M. sphaerospermum).

Cartago: Vicinity of Finca las Concaves, Standley 52502 (US).

COLOMBIA:

Valle: "Cordillera Occidental, vertiente occidental: Hoya del río Sanquiniñí, lado izquierdo, La Laguna, bosques, 1250-1400 m. alt.," Cuatrecasas 15679 (US).

Local names: Chumicos, frijol de playa, jaboncillo (Costa Rica).

Another genus that may be closely related, if not synonymous, is Peekelia Harms (Notizbl. Berlin 7: 26 bis /370/. 1920) based on Phaseolus papuana Pulle from New Guinea. The original description notes, "legumen oblongum vel late oblongum . . . , dehiscens, valvis chartaceis; semina pauca (2-3), subglobosa, . . . sordide atrobrunnea, umbilico lineari impresso, leviter vel levissime canaliculiforme, ultra dimidium vel fere ad 2/3 seminis circumferentiae occupante." The only material I have seen consists of four immature flowers from Versteeg 1795 ex B0; the calyx lobes and subtending bracts suggest that this taxon is at least specifically distinct from Oxyrhynchus volubilis and O. trinervius.

In 1951 O. W. Norvell, from Davis, California, annotated as Oxyrhynchus the type and isotype of Vigna populnea Piper at US (Pringle 2839, collected near Monterrey, Nuevo León, México). No formal combination has been made and I do not wish to do so at this time because of insufficient material. The type is a flowering specimen; the isotype bears an immature fruit about 10 cm. long and 1 cm. wide. With the latter is one immature, subreniform seed about 9 mm. long and 6 mm. wide, with the hilum about 5 mm. long. The calyx most resembles that of Peekelia papuana!

Two other flowering collections from Mexico that might be referable to Oxyrhynchus are Bartlett 10905, from Pico Diablo, near Marmolejo, Tamaulipas, and Hinton 14658, from the Galeana district of Guerrero, but fruiting material is needed to confirm the identification.

QUERCUS X FONTANA LAUGHLIN
COCLUT OAK

Hibrida nova
Quercus coccinea Muenchh. X velutina Lam.

Erythrobalanus Section
Coccineae Series

Kendall Laughlin (1890-)
165 Pine Ave., Chicago, Ill.

Arbor procera 41 cm. diametro tenus et 24 m. alta cum aequis ramis in inferiore arbore, supra ascendentibus membris et numerosis ramis in summo extendentibus. Cortex fuscus cinereus cum latis planis ad perpendicularum directis fastigiis separatis vadosis angulatis rimis. Novi temporis ramuli tomentosi et brunnei; praecedentis temporis ramuli glabri, pingues, durissimi, lucidi cinerei viridi-brunnei. Extremae hiemales gemmae 5-6.5 mm. longae, ovoidae vel turbinatae, angulatae, robiginosae brunneae, tomentosae.

Folia inferiora 6-19 cm. longa, 5-14 cm. lata, firma, circumcurrente adumbratione obovata, base obtusa, apice lato trilobato et plerumque 3 lobis obtusis lateralibus in utroque latere, medio longissimo, lato et truncato, inferiore brevi, autumnis supra brunneocinerea et subtus robiginosa brunnea, supra glabra, subtus pubescentia acervatis pilis, tomentosa in costa media, sero autumnis marcescentia et in arbore manentia. Folia superiora 11-20 cm. longa, circiter 15 cm. longa, 8.5-16 cm. lata, firma, supra leviter lucida et glabra, subtus hebetia vel leviter lucida et glabrata, variantia sanguinea ante decidentia novo Novembre, circumcurrente adumbratione oblongo-acuta vel ovalia, divisa in plerumque 3 dentatos laterales lobos in utroque latere, inferioribus plerumque falcatis et medio circa constantis latitudinis ad 4-7-mucronatum apicem, interdum cum additio inferiore angusto integro acuto lobo, separatos orbiculatis sinibus extendentibus quinque-sextis ad costam mediam; lobus extremus mucronatus trilobatusque inaequalibus lobulis et setis. Folia superiora simulacrum velutinae raro habent cum latis superioribus lobis. Basis superiorum foliorum concava-obtusa vel interdum truncata et saepe inaequalis.

Petioli inferiorum foliorum 1-2.7 cm. longi, in superficie complanati, tomentosi. Petioli superiorum foliorum 4.5-8.5 longi, in apice leviter complanati, infra rotundi, plerumque rufo-brunnei, glabri.

Glandes solae aut compositae, 19-26 mm. longae; cupula poculoformis, 10-17 mm. alta, 17-28 plerumque 22 mm. lata, intus glabra, tecta laxius imbricatis stramineis vel pallidis brunneo-cinereis lanceolatis obtusis glabratis squamis, extendentibus sub rotunda base cupulae 3 mm. super toro ad juncturam cum pedunculo, qui raro 7 mm. longus est; nux pallida rufo-brunnea, raro straminea, interdum languide striata, pallido cinereo tomentulo varia, oblata vel oblonga, saepe tenuibus leviter irregularibus concentris circulis circa apicem, 15-22 mm. longa, 13-20 mm. lata, 1/3-3/5 conclusa in cupula.

Holotypus in Kewensibus Hortis.

QUERCUS X FONTANA LAUGHLIN

A tall tree up to 41 cm. in diameter and 24 m. tall with horizontal branches on the lower half of the tree, ascending limbs above and numerous branches spreading out in the crown. Bark dark gray with broad flat vertical ridges, separated by shallow angled troughlike fissures. Season's branches tomentose and brown; last year's branchlets glabrous, stout, exceedingly tough, lustrous grayish greenish brown. Terminal winter buds 5-6.5 mm. long, ovoid or conic, angled, rusty brown, tomentose.

Blades of lower leaves 6-19 cm. long, 5-14 cm. wide, firm, obovate in peripheral outline, with an obtuse base, a broad trilobate apex and usually 3 pairs of obtuse lateral lobes, the middle one the longest, broad and truncate, the lower one short, brownish gray above and rusty brown beneath in the fall, glabrous above, pubescent with clustered hairs beneath, tomentose on the midrib, shriveling late in the fall and remaining on the tree. Blades of upper leaves 11-20 cm. long, averaging 15 cm. long, 8.5-16 cm. wide, firm, slightly lustrous and glabrous above, dull or slightly lustrous and glabrate beneath, turning blood red before falling in early November, oblong-acute or oval in peripheral outline, divided into usually 3 pairs of toothed lateral lobes, the lower ones usually falcate and the middle one of about constant width toward the 4-7-mucronate apex, occasionally with an additional lower narrow entire acute lobe, separated by rounded sinuses extending five-sixths of the way to the midrib; the terminal lobe mucronate and trilobate with unsymmetrical lobules and bristles. Blades of upper leaves rarely resemble velutina, with broad upper lobes. Base of upper leaf blades concave-obtuse or sometimes truncate and often unsymmetrical.

Petioles of lower leaves 1-2.7 cm. long, flattened on their upper surface, tomentose. Petioles of upper leaves 4.5-8.5 cm. long, slightly flattened at their apex, terete below, usually reddish brown, glabrous.

Acorns solitary or paired, 19-26 mm. long; cup bowl-shaped, 10-17 mm. high, 17-28 usually 22 mm. wide, glabrous inside, covered with rather loosely imbricated stramineous or light brownish gray lanceolate obtuse glabrate scales, extending below the rounded base of the cup for a distance of 3 mm. over the torus to its connection with the peduncle, which is rarely 7 mm. long; nut light reddish brown, rarely stramineous, sometimes faintly striate, mottled with light gray tomentulum, oblate or oblong, often with fine slightly irregular concentric rings around the apex, 15-22 mm. long, 13-20 mm. wide, $1/3$ to $3/5$ enclosed in the cup.

DISCUSSION

There is a hybrid-swarm of this newly discovered hybrid of the Scarlet Oak Quercus coccinea Muenchh. and the Black Oak Q. velutina Lam. on the ridge south of Mo. Hiway 103 in the Big Spring State Park four miles south of Van Buren, Carter County, Missouri, U.S.A. The tree chosen as the type tree, which has a diameter of 15 inches, a circumference of 3 feet 9 inches and a height of 61 feet, is on the north side of the ridge road close to the west line of the SE $\frac{1}{4}$ of Section 6 T26N R1E about 440 yards east of the meridian of 91° and about one thousand yards south of the Big Spring, which discharges 846 million gallons a day. There is another fontana on the hillside about four hundred feet west of this tree with a circumference of 4 feet 2 inches and a height of 78 feet. The above description has been taken from both these trees. There is a Scarlet Oak with a circumference of 7 feet 6 inches fifteen feet northeast of the latter tree.

The terrain is a rocky ridge with scanty soil running northeast to the Current River, which is about half a mile distant. The nearby trees are mostly Quercus coccinea, velutina, stellata, alba and Carya tomentosa. There are a number of Oaks on the ridge and its north slope that have acorns more or less intermediate between coccinea and velutina. Some of these trees look like coccinea but their upper cup-scales are crimped like velutina. Other trees look like velutina but their acorn-nuts are broad and

reddish, suggesting coccinea. Oblate nuts are a common form of coccinea in this park.

The lower and the upper leaves of fontana are entirely different. The lower leaves look like the form of velutina that has broad lobes and shallow sinuses but they are more hairy. The upper leaves resemble coccinea, but the sinus above the middle lobe is not as high as in coccinea and the leaf-tissue at the sinus is not less than 1.7 cm. wide.

In the general form of the acorns of fontana the cups resemble velutina and the nuts resemble coccinea. The acorns of the type tree lean towards velutina; the cup-scales are stramineous, the nuts are lighter colored and concentric circles show up rarely and obscurely. The acorns of the other tree lean towards coccinea; the cup-scales are light brownish gray and the nuts are like coccinea.

The common name Coclut Oak bestowed upon this tree represents a telescoping of the specific epithets of the parent species.

The holotype will be deposited in the Royal Botanic Gardens, Kew, England, and an isotype will be deposited in the United States National Museum, Washington, D.C.

THE TYPE TREE OF QUERCUS XFONTANA



Circumference 3 feet 9 inches

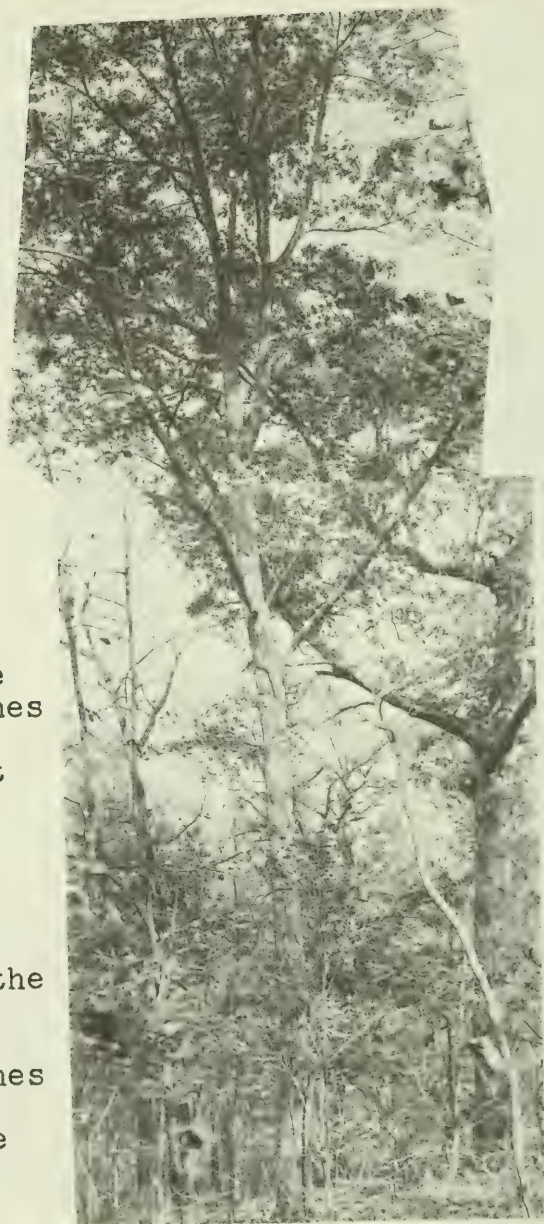
Hight 61 feet

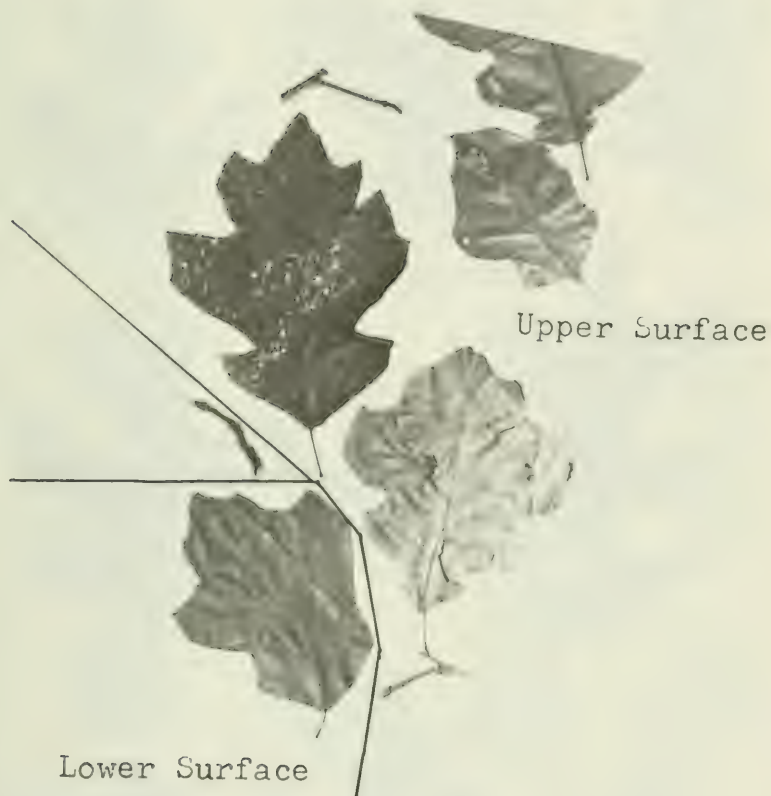
QUERCUS
XFONTANA

Circumference
4 feet 2 inches

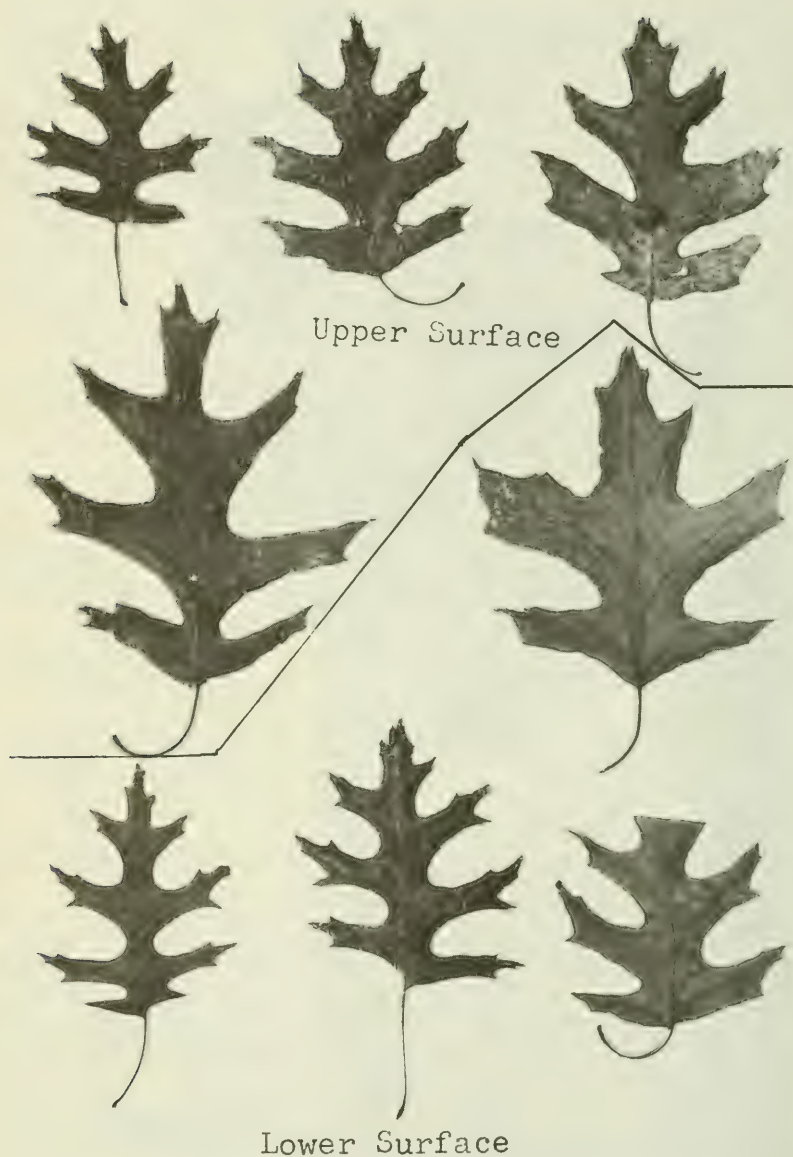
Hight 78 feet

The tree on the
right is a
Scarlet Oak
7 feet 6 inches
in
circumference





LOWER LEAVES OF QUERCUS XFONTANA x $\frac{1}{4}$



UPPER LEAVES OF QUERCUS XFONTANA $\times \frac{1}{4}$



ACORNS OF QUERCUS XFONTANA x 3/4

ADDITIONAL NOTES ON THE GENUS VITEX. VI

Harold N. Moldenke

VITEX NEGUNDO L.

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V. S. Rao, Journ. Indian Bot. Soc. 31: 304, fig. 36—38. 1952; Moldenke in Humbert, Fl. Madag. 174: 79, fig. 10 (3 & 4). 1956; Liu, Illustr. Nat. & Introd. Lign. Pl. Taiwan 2: pl. 1037. 1962; Li, Wood. Fl. Taiwan 833, fig. 334. 1963; Sharma & Mukhopadhyay, Journ. Genet. 58: 383, pl. 11, fig. 30. 1963.

Recent collectors describe this plant as a bush 5—10 feet tall, fruiting also in July. The corollas are described as "violet" on Koelz 25155, "violet, lip paler" on Koelz 22885, "lavender" on Koelz 30110, and "bluish, center of the hood white" on Chand 7691. Nair & Rehman (1962) describe the pollen as 3-zonicolpate, prolate ($39 \times 27 \mu$; range $35—39 \times 25—28 \mu$), the colpi end acute, tenuimarginate, the margin spightly wavy, 2.8μ wide, narrower toward the ends, the apocolpium diameter 7μ , the exine 0.5μ thick, the ectine almost as thick as the endine, psilate. Kitamura (1960) refers to V. negundo as a "vicariant" of V. agnus-castus L.

The Lam (1924) reference in the bibliography is often cited as "1925", but the latter date is merely the title-page date for the volume; the pages cited appeared in 1924. The Boissier (1879) reference is sometimes given as "1875", but the page involved was apparently not published until 1879.

The original description of V. arborea Fischer (1829) is as follows: "Foliis digitatis; foliolis 5 lanceolatis, acuminatis, serratis, nervis obliquis impressis; racemis paniculatis, terminalibus. Frutex 6—8-pedalis aut altior. Rami juniores, petioli, nervi foliorum, calicesque pubescentes. Corolla alba. Affinis V. Agn. casto, Lin. Differt foliis non laevibus, nervis obliquis paginae superioris profunde insculptis, ita ut quasi rugosa videatur." It appears, therefore, that this name belongs in the synonymy of f. alba P'ei, rather than in the synonymy of the typical form of the species, as previously regarded.

The original description of Agnus castus negundo Carr. (1871) is "Arbrisseau ou petit arbre très-ramifié, à port et facies rappelant généralement ceux des Agnus castus vulgaris, à folioles plus courtes et plus largement ovales, dentées, d'un vert aussi un peu plus intense, parcourues de nervures saillantes qui, en dessus, forment des enfoncements réguliers. Inflorescence paniculée-spiciforme, largement ramifiée, à ramifications grêles, allongées-étalées. Fleurs très-petites, blanchâtres, très-légèrement lilacées."

The species has been found growing in hedges and sandy riverbeds, on forest-demuded hillslopes and flat ground, along streams and in the immediate neighborhood of Salix tetrasperma on riversides. It is recorded from Rameswaram and Krusadi Islands by Rao, Aggarwal, & Mukherjee (1963), where it is found with Clerodendrum indicum, grasses, and sedges on consolidated sand dunes with pinkish-white soil. Rao & Sastry (1964) state that it is "common along watercourses" in the shrub strata in Madhya Pradesh, where Joseph (1963) also records it as "fairly common near streams". Vyas (1965) records it as "common in the middle zone" in north-

eastern Rajasthan, at 360—520 meters altitude. Arora & Aggarwal (1965) describe it as "cultivated or naturalized on the main strand." Mukerjee (1965) calls it "common in villages" in West Bengal; Malick (1966) also describes it as "common" in that state. Panigrahi (1966) refers to it as "abundant on dry open flat tops of hills", while Bose (1920) calls it "a common shrub or tree with trifoliate or quinate leaves". Dastur (1952) avers that the species is found throughout India and Pakistan, ascending to 5,000 feet in the northwestern Himalayas. He tells us that the wood is hard and grayish-white, is used for building purposes and for firewood, the ashes used in dyeing, and the aromatic leaves as an insect repellent. He also tells us that it is used in combination with other drugs in vapor baths against fevers, the roots and leaves in the treatment of snakebite, especially the bites of the cobra, that the leaves are smoked like tobacco for catarrh and headache, in bathing by women after childbirth and for cleansing maggoty ulcers, and that the flowers are a cardiac tonic and astringent and are employed in the treatment of diarrhea.

Nath (1960) states that V. negundo is planted to reclaim swamp land. Janardhanan (1963) also states that the leaves are a tonic and vermifuge, the leaf juice used by the natives in Maharashtra to remove fetid discharges and worms from ulcers. Datta (1965) reports the leaves used as a febrifuge and for preserving stored grain against insect attack. Jain (1963) and Deb (1963) content themselves with saying that it is a medicinal plant. King (1966) says that Vitex negundo with Loranthus longiflorus attached is used medicinally, inasmuch as both the host and the parasite are said to have medicinal properties; they are boiled together and used as a cough remedy. Chavan & Oza (1966) report that in Gujarat it is used to cure headaches, its flowers and fruits almost all through the year, and regard V. bicolor Willd. as a synonym.

Chopra, Badhwar, & Ghosh (1965) report that the plant is "called Indian privet, common throughout India; contains trace of an alkaloid and is largely used as an alterative, expectorant, febrifuge, tonic, and for promoting the growth of hair; the plant's leaves are also laid over stored grain to keep off insects; the plant also appears NOT to be eaten by cattle."

Additional vernacular names recorded for this species are "English privet", "indrani", "kyaung-ban", "kyet-yo", "kyi-u-ban", "kyi-yo", "malamala akako" [also applied to Sophora tomentosa], "malamala alako", "m̄-kian-keng", "m̄-kian-tê", "nagdoz", "nagod", "negundoblätteriger Mönchspfeffer", "nirgud", "nishindi", "pōh-kiun-ā", "po-kiun", "ran-gura", "shirwari", "taiwan-ninzinboku", and "zuugora".

Itakawa & Yamasita (1942) report the presence of sabinene, $C_{10}H_{16}$, in this plant as well as in such diverse other species as Chamaecyparis formosensis and C. obtusa, Cupressus macrocarpa, Curcuma longa, Hyptis suaveolens, Juniperus sabina, Libocedrus bidwillii, Ocimum canum, Piper cubeba, Pittosporum eugenioides, Thuja occidentalis, Thujopsis dolabrata, and Zanthoxylum rhetsa.

Karrer (1958) reports the presence of protocatechus⁷⁶ture, $C_7H_6O_4$, in this plant as well as in such other diverse plants as Aralia chinensis, Cerasus lusitanica, Escallonia tortuosa, Hibiscus sabdariffa, Illicium religiosum, Phycomyces blakesleeana, and Thespesia lampas. He also reports the presence of p-oxybenzo⁷⁶esture, $C_7H_6O_3$, in Vitex negundo and in Catalpa bignonioides, C. ovata, Grindelia robusta, and Populus balsamifera. Belič & Cerin (1962) found casticin in the seeds of Vitex negundo. Prasad (1962) tells us that Alectra parasitica grows parasitically on the roots of Vitex negundo in India and that a powder made from this parasite's rhizomes was effective in the treatment of leprosy, with no toxic reactions.

Mani (1965) describes a pouch gall on the upper and lower surfaces of the leaflet-blades of Vitex negundo. It is an irregularly globose, sessile, agglomerate mass of solid fleshy erineum-filled gall tissue, 2--3 x 10--15 mm. in size, made by a species of Eriophytes, and identified by him as his gall number 477.

Sebastine (1959) cites his no. 282, Malick (1966) cites Chatterji 3, and Panigrahi (1966) cites his no. 11891 from India. Nehr & Rehman (1962) cite Nat. Bot. Gard. 35016, slide 2692. Li (1963) cites H. H. Bartlett 6267, Faurie 149 & 338, Gressitt 461, Hayashi 21212, A. Henry 905 & s.n., Nakazawa s.n., Tanaka 97, Tanaka & Shimada 17878, Tseng s.n., and E. H. Wilson 10972 from Formosa. Chavan & Oza (1966) cite Oza 859 & 860 from Gujarat, India.

Material has been misidentified and distributed in herbaria as V. altissima L. f. On the other hand, the H. C. Cheo 4 [Herb. Univ. Nanking 18069], distributed as typical V. negundo, is actually var. heterophylla (Franch.) Rehd., while H. C. Cheo 200 [Herb. Univ. Nanking 18265], Lau 3051, and Ramaswamy 511 are var. intermedia (P'ei) Moldenke; E. H. Bryan 556, Elmer 11999, Kajewski 801, Kondo & Edaño s.n. [Philipp. Nat. Herb. 38739 & 39032], Lutjeharms 4655, R. C. McGregor s.n. [Herb. Philip. Bur. Sci. 10270], Seale s.n. [May 23, 1903], and G. T. Velasquez 11 are all V. trifolia var. bicolor (Willd.) Moldenke, and J. W. Gillespie 2953, 4164.1, & 4691.8 are V. quinata var. puberula (H. J. Lam) Moldenke.

Additional citations: INDIA: Assam: Chand 7691 (Mi); Koelz 22885 (Mi), 25155 (Mi), 30110 (Mi). Bihar: Koelz 19587 (Mi). Hyderabad: Mathur 165 [Herb. Hyderab. 363] (H1-209882). Mysore: Ramaswamy 2897 (Lw). Surguja: Koelz 19519 (Mi). State undetermined: Kuntze 7367 [Fabbalpur] (N). CHINESE COASTAL ISLANDS: Hainan: Lei 202 (Bi), 700 (Mi); W. T. Tsang 622 [Herb. Lingnan Univ. 17371] (Mi). WESTERN PACIFIC ISLANDS: FORMOSA: H. H. Bartlett 6267 (Mi). PHILIPPINE ISLANDS: Luzon: E. D. Merrill 3627 (Bi); Merritt & Darling s.n. [Herb. Philip. Forest. Bur. 13817] (Bi); Otanés s.n. [Herb. Philip. Bur. Sci. 17995] (Bi). CULTIVATED: Ha-

waiian Islands: Neal s.n. [4/20/46] (Bi), s.n. [Alamoana Park, Jan. 6, 1953] (Bi); Tongg s.n. [Honolulu, 5/24/32] (Bi, Bi).
Missouri: D. B. Dunn 12618 (Lb—39798). North Carolina: A. C. Mathews s.n. [Fall 1938] (Hi—21152).

VITEX NEGUNDO f. ALBA P'ei

Synonymy: Vitex arborea Fischer ex Desf., Cat. Hort. Paris, ed. 3, 391--392. 1829. Vitex arborea Desf. ex Schau. in A. DC., Prodr. 11: 685, in syn. 1847.

Additional bibliography: Desf., Cat. Hort. Paris, ed. 3, 391--392. 1829; Schau. in A. DC., Prodr. 11: 685. 1847; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 2: 1213 (1895), pr. 2, 2: 1213 (1946), and pr. 3, 2: 1213. 1960; Moldenke, Phytologia 8: 66--67. 1961.

The two binomials given in the synonymy above were cited by me as typical V. negundo L. in my previous publications, but a perusal of the original description reveals that it contains the phrase "Corolla alba" and therefore doubtless refers to the present color form.

VITEX NEGUNDO var. CANNABIFOLIA (Sieb. & Zucc.) Hand.-Mazz.

Emended synonymy: Vitex cannabifolia var. latifolia Miq., Cat. Mus. Bot. Lugd.-Bat. 70. 1870.

Additional & emended bibliography: Kwa-wi [trans. Savatier], Arbor. 4: pl. 1. 1759; Miq., Cat. Mus. Bot. Lugd.-Bat. 70. 1870; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 2: 1213. 1895; C. K. Schneid., Illustr. Handb. Laubholz. 2: 592 & 594--595, fig. 384 q. 1911; Stapf, Ind. Lond. 6: 478. 1931; Hand.-Mazz., Act. Hort. Gothenb. 9: [67]--68. 1934; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 2, 2: 1213 (1946) and pr. 3, 2: 1213. 1960; Moldenke, Phytologia 8: 67. 1961; Belič & Čerin, Vestnik Slovensk. Kemij. Drust. 9: 33. 1962; Neal, In Gard. Hawaii, ed. 2, 729. 1965.

Additional illustrations: Kwa-wi [trans. Savatier], Arbor. 4: pl. 1. 1759; C. K. Schneid., Illustr. Handb. Laubholz. 2: fig. 384 q. 1911.

Belič & Čerin (1962) report the presence of casticin in the seeds of this plant. Miquel (1870) cites, and apparently based his var. latifolia upon, "Siebold 5 [specimens?], Bürger 2 [specimens?]".

VITEX NEGUNDO var. DENSIFLORA Haines, Bot. Bihar & Orissa 4: 712. 1922.

Bibliography: Haines, Bot. Bihar & Orissa 4: 712. 1922; Moldenke, Résumé Suppl. 15: 9. 1967.

The original description of this taxon reads as follows: "Leaves all 3-foliolate; leaflets smaller, 1--3 inches, more broadly lanceolate; panicle almost thyrsiform; corolla very tomentose, only .25 in. long. diameter. Along the Sone, Palamau! The root is tonic, febrifuge and expectorant, and the leaves tonic and

vermifuge. A decoction with long pepper is given in catarrhal fever. Dutt." I know nothing further about this plant.

VITEX NEGUNDO var. HETEROPHYLLA (Franch.) Rehd.

Additional synonymy: Vitex incisa L. ex Carr., Rev. Hort. 42/43: 415—416. 1871. Agnus-castus incisa Carr. ex Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 1: 59, in syn. 1893. Vitex agnus castus incisa Hort. ex Beissner, Schelle, & Zabel, Handb. Laubh. 426, in syn. 1903. Vitex agnus castus serrata Hort. ex Beissner, Schelle, & Zabel, Handb. Laubh. 426, nom. nud. 1903. Vitex incisa negunda Pellett ex Milum, Biol. Abstr. 27: 1035, sphalm. 1953. Vitex sinensis Mill. ex Belić & Čerin, Vestnik Slovensk. Kemij. Drust. 9: 33. 1962. Vitex negundo-incisa Belić & Čerin, Vestnik Slovensk. Kemij. Drust. 9: 33. 1962. Vitex negundo heterophylla Harkness, Phytologia 10: 269. 1964. Vitex negundo-incisa Clarke ex Moldenke, Résumé Suppl. 15: 25, in syn. 1967.

Additional & emended bibliography: Bocq., Adansonia 2: 101—103, 109, 111, 132, 164, & 165 (1862) and 3: 253, pl. 6, fig. 1—25. 1863; Bocq., Rev. Verbenac. 101—103, 109, 111, 132, 164, 165, & 253, pl. 6, fig. 1—25. 1863; Carr., Rev. Hort. 42/43: 415—416. 1871; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 1: 59 (1893) and 2: 1213 & 1214. 1895; Beissner, Schelle, & Zabel, Handb. Laubh. 426. 1903; Haines, Bot. Bihar & Orissa 4: 712. 1922; L. H. Bailey, Man. Cult. Pl., ed. 1, pr. 1, 632 & 849 (1924) and pr. 2, 632 & 849. 1925; Svenson, Brooklyn Bot. Gard. Record 22: 7. 1933; L. H. Bailey, Man. Cult. Pl., ed. 1, pr. 3, 632 & 849 (1938) and pr. 4, 632 & 849. 1944; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 2, 1: 59 (1946) and 2: 1213 & 1214. 1946; L. H. Bailey, Man. Cult. Pl., ed. 2, 844 & 1114. 1949; W. J. Bean in Chittenden, Roy. Hort. Soc. Dict. Gard. 4: 2249 & 2250. 1951; Pellett, Amer. Bee Journ. 92: 430—431. 1952; Milum, Biol. Abstr. 27: 1035. 1953; Mattoon, Pl. Buyers Guide, ed. 6, 294. 1958; Moldenke, Biol. Abstr. 32: 1135. 1958; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 3, 1: 59 (1960) and 2: 1213 & 1214. 1960; T. H. Everett, New Illustr. Encycl. Gard. 13: 2433 & 2434. 1960; Moldenke, Phytologia 8: 67—68. 1961; Belić & Čerin, Vestnik Slovensk. Kemij. Drust. 9: 33. 1962; W. J. Cody, Ind. Sem. 1963: 9. 1963; Harkness, Phytologia 10: 269. 1964; Moldenke, Résumé Suppl. 11: 8 (1964) and 12: 9. 1965; N. Taylor, Guide Gard. Shrubs & Trees 325. 1965; Moldenke, Résumé Suppl. 15: 15, 16, 24, & 25. 1967.

Additional & emended illustrations: Bocq., Adansonia 3: [Rev. Verbenac.] pl. 6, fig. 1—25. 1863; C. K. Schneid., Illustr. Handb. Laubholz. fig. 385 r—t. 1911; W. J. Bean in Chittenden, Roy. Hort. Soc. Dict. Gard. 4: 2250. 1951; M. A. Pellett, Am. Bee Journ. 92: 430. 1952.

Beissner, Schelle, & Zabel (1903) record the common name "eingeschnittener Mönchspfeffer" for this plant.

The corollas are described as "pinkish" on Allard 11390, and the plant has been found flowering in July. Belić & Čerin (1962) re-

port the presence of casticin in its seeds. Everett (1960) tells us that it is the hardiest of the cultivated forms of the genus, surviving as far north as southern New England; Taylor (1965) reports that it may be cultivated safely up to Life Zone 4 in North America. Cody (1963) records it as cultivated in Canada, and Pellett (1952) in Cass County, Iowa. Mattoon (1958) lists 5 horticultural sources.

Pellett (1952) reports that honeybees work this variety, but other varieties are not particularly useful for honey. In southern Missouri it is reported to furnish up to three months of solid bloom, long after sweet-clover bloom is past, until almost up to frost. It is also good as a windbreak plant. It is very hardy in Oklahoma, withstanding drought; farther north it winterkills so it cannot be naturalized. It blooms at an early age on the new wood. It was introduced from China by the Bureau of Plant Industry, Washington. The original discoverer for the Bureau found the plant busy with bees of all kinds. The Chinese employ it for basket manufacture. It is usually propagated from seeds, with only a small percentage of growth. It should be propagated for the late season bee pasture.

Material has been misidentified and distributed in herbaria as typical V. negundo L.

Additional citations: CHINA: Hupeh: H. C. Chao 4 [Herb. Univ. Nanking 18069] (Bi, Bi). CULTIVATED: England: P. Miller s.n. [Chelsea Physic Gard.; Bailey Hort. neg. 5055] (N—photo). Indiana: D. B. Dunn 12585 (Lb—37912), 12879 (Lb—39954). Virginia: Allard 11390 (Du—350280).

VITEX NEGUNDO var. HETEROPHYLLA f. ALBA (Carr.) Moldenke, Résumé Suppl. 15: 15, hyponym (July 17, 1967), comb. nov.

Synonymy: Agnus castus incisa alba Carr., Rev. Hort. 42/43: 416. 1871.

This form differs from the typical form of the variety in having white corollas. The original description by Carrière (1871) reads as follows: "Diffère du type par ses fleurs d'un blanc pur. Plante très-jolie et très-floribonde."

VITEX NEGUNDO var. HETEROPHYLLA f. MULTIFIDA (Carr.) Rehd.

Additional & emended synonymy: Agnus castus incisa multifida Carr., Rev. Hort. 42/43: 416. 1871. Agnus castus incisa var. multifida Carr. ex C. K. Schneid., Illustr. Handb. Laubholzsk. 2: 594, in syn. 1911. Vitex negundo heterophylla 'Multifida' Harkness, Phytologia 10: 269. 1964.

Additional & emended bibliography: Carr., Rev. Hort. 42/43: 416. 1871; C. K. Schneid., Illustr. Handb. Laubholzsk. 2: 594, fig. 384 m & n. 1911; Moldenke, Phytologia 6: 15—16. 1957; Moldenke, Résumé Suppl. 11: 8. 1964; Harkness, Phytologia 10: 269. 1964; Moldenke, Résumé Suppl. 15: 11. 1967.

Emended illustrations: C. K. Schneid., Illustr. Handb. Laubholzsk. 2: fig. 384 m & n. 1911.

The original description of this plant by Carrière (1871) is as follows: "Diffère du précédent [Agnus castus incisa] par ses rameaux plus ténus, par ses feuilles plus réduits dans toutes leurs parties et plus profondément dentées dans toute leur longueur. Fleurs très-nombreuses, d'un beau bleu, relativement grandes. Plante très-naine et très-floribonde."

VITEX NEGUNDO var. INTERMEDIA (P'ei) Moldenke

Additional synonymy: Vitex incisa Lav. ex Moldenke, Résumé Suppl. 3: 42, in syn. 1962.

Additional bibliography: Hand.-Mazz., Act. Hort. Gothenb. 9: 68. 1934; Lombardo, Arbust. & Arbustil. Pas. Publ. 41, 43, 242, & 314. 1961; Moldenke, Phytologia 8: 68. 1961; Moldenke, Résumé Suppl. 3: 42 (1962) and 11: 5. 1964; Liogier, Rhodora 67: 350. 1965.

Traverse describes this plant as a "tree-shrub 6 m. tall; basal diam. 7 cm. (1 of 4 stems); crown diam. 7 m. (whole clump); loosely irregularly branched, but forming rather dense terminal twigs; bark smooth, tan-brown with vertical ribbings; corolla purple, lip having cream inside, speckled with purple; flower has sweet minty odor, June". He found it on the bank of a ditch at the edge of a yard. Material has been misidentified and distributed in herbaria as typical V. negundo L. and as "Vitex nigundo L."

Unfortunately, P'ei (1932) did not designate any type in his original description of this taxon, and cites the following specimens: CHINA: Chekiang: Barchet 556 & s.n., Ching 2429, Herb. Univ. Nanking 14580. Fukien: Chang & Metcalf 275, Cheng 711, Norton 1558. Honan: Herb. Canton Chr. Coll. 250. Kiangsu: Herb. Univ. Nanking 659, 2990, & 10729, Ren & Tao 27, Young 3236. Kwangtung: Herb. Canton Chr. Coll. 250, 376, 1585, & 3305; Ying 1059. Szechuan: E. H. Wilson 4308 & 4308a. Yunnan: Bock 6981, Maire 1776. HONGKONG: C. Wright s.n.

Additional citations: TEXAS: Harris Co.: Traverse 1322 (Rf). CUBA: Las Villas: A. Gonzales 100 (M1, N). INDIA: Mysore: Ramaswamy 511 (Z). CHINA: Hupeh: Cheo 200 [Herb. Univ. Nanking 18265] (B1). CHINESE COASTAL ISLANDS: Hainan: Lau 3051 (B1).

VITEX NEGUNDO var. MICROPHYLLA Hand.-Mazz.

Bibliography: Hand.-Mazz., Symb. Sin. 7: 906. 1936; Moldenke, Phytologia 6: 20. 1957; Moldenke, Résumé 171 & 477. 1959.

VITEX NEGUNDO var. SESSILIS Moldenke

Additional bibliography: Moldenke, Phytologia 6: 20—21. 1957; Moldenke, Résumé 226 & 477. 1959.

VITEX NEO-CALEDONICA Gandoger

Additional bibliography: A. W. Hill, Ind. Kew. Suppl. 6: 219. 1926; Moldenke, Phytologia 6: 21. 1957; Moldenke, Résumé 206, 387,

& 477. 1959.

VITEX NLONAKENSIS Engl.

Additional bibliography: A. W. Hill, Ind. Kew. Suppl. 8: 249. 1933; Moldenke, Phytologia 6: 21--22. 1957; Moldenke, Résumé 139 & 477. 1959.

VITEX OBANENSIS Wernham

Additional bibliography: Prain, Ind. Kew. Suppl. 5, pr. 1, 273. 1921; Moldenke, Phytologia 6: 22. 1957; Moldenke, Résumé 138 & 477. 1959; Prain, Ind. Kew. Suppl. 5, pr. 2, 273. 1960; Huber in Hutchinson & Dalz., Fl. W. Trop. Afr., ed. 2, 2: 446. 1963.

Huber (1963) reduces this species to synonymy under V. thyrsoflora J. G. Baker.

VITEX OBOVATA E. Mey.

Additional bibliography: Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 2: 1214 (1895) and pr. 2, 2: 1214. 1946; Moldenke, Phytologia 6: 22--24. 1957; Moldenke, Résumé 154 & 477. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 3, 2: 1214. 1960.

VITEX ODORATA Huber

Additional & emended bibliography: Prain, Ind. Kew. Suppl. 4, pr. 1, 248. 1913; Le Cointe, Amaz. Bras. III Arv. & Plant. Uteis, ed. 1, 429 (1934) and ed. 2, 456. 1947; Moldenke, Phytologia 6: 24--26. 1957; Prain, Ind. Kew. Suppl. 4, pr. 2, 248. 1958; Moldenke, Résumé 112 & 477. 1959.

Illustrations: Huber, Bol. Mus. Goeldi 5: pl. 4, fig. 22 & 23. 1909.

Le Cointe (1947) reports that this species is found in "Nos campos de Marajó, nos lugares altos." Stapf (1931) cites the Huber references as "1907-8".

VITEX ORINOCENSIS H.B.K.

Additional synonymy: Vitex orinocense H.B.K. ex Bocq., Adansonia 3: [Rev. Verbenac.] 253, sphalm. 1863. Vitex orinocensis Kunth ex Le Cointe, Amaz. Bras. III Arv. & Plant. Uteis, ed. 2, 456. 1947. Vitex orinocensis (Miq.) Huber ex Moldenke, Résumé Suppl. 3: 42, in syn. 1962.

Additional bibliography: Bocq., Adansonia 3: [Rev. Verbenac.] 253. 1863; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 2: 1214 (1895) and pr. 2, 2: 1214. 1946; Moldenke, Phytologia 6: 26--27. 1957; Moldenke, Résumé 74, 387, & 477. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 3, 2: 1214. 1960; Moldenke, Résumé Suppl. 14: 10. 1966; Moldenke, Phytologia 15: 89, 99, & 101. 1967.

Tamayo describes this plant as a tree, 6--8 m. tall, the leaves with 3--5 leaflets, called "guarataro", and flowering in April. The type specimen, Bonpland 832, deposited in the herbarium of the Muséum National d'Histoire Naturelle at Paris, was photographed there by Macbride as his type photograph number 39495.

The Ll. Williams 13295, distributed as V. orinocensis, is actu-

ally var. multiflora (Miq.) Huber, while H. Pittier 15069 is V. compressa Turcz.

Additional citations: VENEZUELA: Amazonas: Bonpland 832 [Herb. Willdenow 11704; Macbride photos 39495] (W—photo of type). Guárico: Tamayo 4048 (W—2195307).

VITEX ORINOCENSIS var. GLABRA Moldenke

Bibliography: Moldenke, Phytologia 4: 293—294. 1953; Moldenke, Biol. Abstr. 27: 3121. 1953; Moldenke, Phytologia 6: 27. 1957; Moldenke, Résumé 69 & 477. 1959.

VITEX ORINOCENSIS var. MULTIFLORA (Miq.) Huber

Additional & emended bibliography: Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 2: 1214. 1895; Stapf, Ind. Lond. 6: 479. 1931; Le Cointe, Amaz. Bras. III Arv. & Plant. Uteis, ed. 1, 429. 1934; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 2, 2: 1214. 1946; Le Cointe, Amaz. Bras. III Arv. & Plant. Uteis, ed. 2, 456. 1947; Moldenke, Phytologia 8: 69 (1961) and 15: 101. 1967.

Recent collectors describe this plant as a medium-sized tree, 10—17 m. tall, the trunk diameter 35—40 cm., the bark shallowly and finely fissured, brownish-gray, the leaflets papery, pale-green, slightly glossy above, and the flowers scented, growing on riverbanks, at altitudes of 120—500 m., known as "guarataro" or "taruma frondoso". Bernardi says "Madera dura; corazón de color aceituna", while Le Cointe (1947) reports that it is found in "Nos terrenos argilosos das margens dos rios e tiachos" along the Rio Tapajós, Rio Branco de Óbidos, and "Tesos da cont a-costa de Marajó". He also reports that the wood is used "Propria para lugares úmidos, esteios, moirões, dormentes, segeria". The corollas are described as "blue" on Aristeguieta 4574, "lilac" on Archer 7722, and "pale-purple" on Breteler 3662.

An isotype, Kappler 1366, deposited in the herbarium of the Botanisches Museum at Berlin, was photographed there by Macbride as his type photograph number 17562, but is now destroyed.

Material has been misidentified and distributed in herbaria as typical V. orinocensis H.B.K. On the other hand, the Arnoldo 1624, distributed as var. multiflora, is actually V. cymosa Bert. Ducke 836 was taken from material cultivated in Pará, but originally from Marajó Island.

Additional citations: VENEZUELA: Apure: Vélez 2699 (Ve). Barinas: Bernardi 1205 (Ve—47796); Breteler 3662 (N). Bolívar: Bernardi 2915 (Ve); J. A. Steyermark 90773 (Ca); Ll. Williams 13295 (W—1802201). Guárico: Aristeguieta 4574 (Ve). SURINAM: Kappler 1366 [Macbride photos 17562] (W—photo of isotype). BRAZIL: Pará: Fróes 34183 (S). CULTIVATED: Brazil: Archer 7722 (N, S); Ducke 836 (W—1875664).

VITEX OSCITANS Moldenke

Synonymy: Vitex occitans Moldenke in Humbert, Fl. Madag. 174:

115, sphalm. 1956.

Bibliography: Moldenke, *Phytologia* 3: 443—444. 1951; Moldenke in Humbert, *Fl. Madag.* 174: 73, 75, 114—116, & 273, fig. 17 (2 & 3). 1956; Moldenke, *Phytologia* 6: 31. 1957; G. Taylor, *Ind. Kew. Suppl.* 12: 151. 1959; Moldenke, *Résumé* 157 & 477. 1959; Moldenke, *Résumé Suppl.* 15: 25. 1967.

Illustrations: Moldenke in Humbert, *Fl. Madag.* 174: 115, fig. 17 (2 & 3). 1956.

VITEX OXYCUSPIS J. G. Baker

Additional bibliography: K. Schum. in Just, *Bot. Jahresber.* 28 (1): 497. 1902; Thiselt.-Dyer, *Ind. Kew. Suppl.* 2: 194. 1904; Cooper & Record, *Yale Univ. Sch. Forest. Bull.* 31: 118 & 153. 1931; Dalz., *Useful Pl. W. Trop. Afr.* 458. 1937; Aubrév., *Fl. For. Cot. Iv.*, ed. 2, 3: 232, pl. 336, fig. 4. 1959; Moldenke, *Phytologia* 8: 69. 1961; F. R. Irvine, *Woody Pl. Ghana* 764. 1961; Huber in Hutchinson & Dalz., *Fl. W. Trop. Afr.*, ed. 2, 2: 445 & 446. 1963; Moldenke, *Phytologia* 15: 264. 1967.

Illustrations: Aubrév., *Fl. For. Cot. Iv.*, ed. 2, 3: pl. 336, fig. 4. 1959.

Irvine (1961) tells us that this is a tree of secondary forests, 15--35 feet tall, with a trunk 3 feet in diameter, the branchlets glabrous, leaves digitate, leaflets 5, oblanceolate, mostly over 4 inches long, acuminate at the apex, coarsely serrate along the margins, cuneate at the base, almost glabrous, the flowers small, in lax long-pedunculate cymes, the calyx nearly glabrous, and the fruits black, to 1 inch long. Dalziel (1937) reports that the wood is white and soft, used only for house-poles. It has been found in flower in February and in fruit in November. The vernacular name "kpar-seh" is applied also to *V. rufa* A. Chev. and "fevei" is applied also to *V. micrantha* Gürke.

Huber (1963) cites the following specimens: SIERRA LEONE: D. Small 613; Unwin & Smythe 37. LIBERIA: G. P. Cooper 321. IVORY COAST: Boughey G.C.14858. NIGERIA: Southern: Jones & Keay F.H.I. 36163; A. F. Ross 234; Talbot 2061 bis. He also records it from Angola.

VITEX OXYCUSPIS var. MOSSAMBICENSIS Moldenke

Bibliography: Moldenke, *Bol. Soc. Brot.*, ser. 2, 40: 122. 1966.

This variety differs from the typical form of the species in having its branchlets shortly fulvous-puberulent, the petioles to 11 cm. long, the leaflets elliptic, minutely fulvous-puberulent beneath, the peduncles to 1.5 cm. long and densely short-pubescent, the branches of the inflorescence and the calyx densely short-pubescent, and the calyx-teeth large and triangular.

The type of the variety was collected by Dr. António Rocha da Torre (no. 6323, in part) in sandy soil in dense deciduous forest of *Brachystegia* at Dondo, Cheringoma, Manica e Sofala, Portuguese East Africa, on December 31, 1943, and is deposited in the her-

barium of the Centro de Botânica, Junta de Investigações, in Lisbon. The type specimen was originally mixed with material of V. tangensis Gürke.

Citations: PORTUGUESE EAST AFRICA: Manica e Sofala: Torre 6323, in part (UL—type, UL—isotype).

VITEX PACHYCLADA J. G. Baker

Additional & emended bibliography: Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 2: 1214. 1895; Pieper in Engl., Bot. Jahrb. 62, Beibl. 141 ["142"]: 76, 79, & 84, pl. 11. 1928; Worsdell, Ind. Lond. Suppl. 2: 500. 1941; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 2, 2: 1214. 1946; Moldenke in Humbert, Fl. Madag. 174: 77, 144—146, & 273, fig. 23 (5 & 6). 1956; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 3, 2: 1214. 1960; Moldenke, Phytologia 8: 69. 1961.

Illustrations: Pieper in Engl., Bot. Jahrb. 62, Beibl. 141 ["142"]: pl. 11. 1928; Moldenke in Humbert, Fl. Madag. 174: 145, fig. 23 (5 & 6). 1956.

VITEX PACHYPHYLLA J. G. Baker

Additional bibliography: K. Schum. in Just, Bot. Jahresber. 28 (1): 497. 1902; Thiselt.-Dyer, Ind. Kew. Suppl. 2: 194. 1904; Stapf, Ind. Lond. 6: 479. 1931; Moldenke, Phytologia 6: 33—34. 1957; Moldenke, Résumé 140 & 477. 1959.

VITEX PADANGENSIS H. Hallier

Additional bibliography: A. W. Hill, Ind. Kew. Suppl. 6: 219. 1926; Moldenke, Phytologia 8: 69. 1961.

VITEX PANSHINIANA Moldenke

Additional synonymy: Vitex panshiana Moldenke, Résumé Suppl. 6: 11, in syn. 1963.

Additional bibliography: Hill & Salisb., Ind. Kew. Suppl. 10: 244. 1947; Moldenke, Phytologia 6: 34—36 & 83 (1957) and 8: 69—70. 1961; Moldenke, Résumé Suppl. 6: 11. 1963; Moldenke, Phytologia 15: 110. 1967.

Recent collectors describe this plant as a tree, 8—15 m. tall, the trunk 50 cm. in diameter, and the calyx green, leaning over rocks in thin woody vegetation at the edge of the forest on soil overlying rock, at 100 m. altitude, flowering in October. The corollas are described as "white and lilac" on Ducke 2488 and "blue to partially bluish-white" on Murça Pires & Westra 48839.

Additional citations: BRAZIL: Amapá: Murça Pires & Westra 48839 (N). Ceará: Ducke 2488 (N, W—2341338).

VITEX PANSHINIANA var. PULCHRA Moldenke

Additional bibliography: Moldenke, Phytologia 6: 36 & 83. 1957; Moldenke, Résumé 111 & 477. 1959.

VITEX PARVIFLORA A. L. Juss.

Additional synonymy: Vitex timorensis Walp. ex E. D. Merr., Philip. Journ. Sci. Bot. 1, Suppl. 1: 121, sphalm. 1906. Vitex parviflora Juss. ex Moldenke, Résumé Suppl. 3: 42, in syn. 1962. Vitex altissima "Naves ex F. Villar" apud Menninger, Seaside Pl. 213. 1964.

Additional & emended bibliography: Bocq., Adansonia 3: [Rev. Verbenac.] 253. 1863; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 2: 1213 & 1214. 1895; Perkin, Journ. Chem. Soc. 73: 1019. 1898; Brandis, Indian Trees 503. 1906; E. D. Merr., Philip. Journ. Sci. Bot. 1, Suppl. 1: 121. 1906; E. D. Merr., Interpret. Rumph. Herb. Amboin. 452 & 594. 1917; A. W. Hill, Ind. Kew. Suppl. 6: 219. 1926; Stapf, Ind. Lond. 6: 478 & 479. 1931; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 2, 2: 1213 & 1214. 1946; Hill & Salisbury, Ind. Kew. Suppl. 10: 244. 1947; Neal, In Gard. Hawaii, ed. 1, 643. 1948; H. F. MacMillan, Trop. Plant. & Gard., ed. 5. 1948; Moldenke in Humbert, Fl. Madag. 174: 77. 1956; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 3, 2: 1213 & 1214. 1960; Maun, Philip. Journ. Forest. 16: 95—110. 1960; Moldenke, Phytologia 8: 70—71. 1961; Menninger, Hort. Books Warm Regions [8]. 1961; Anon., Biol. Abstr. 40: B.115. 1962; Meher-Homji, Trav. Sect. Scient. Inst. Franç. Pond. 7 (1): 171. 1963; Menninger, 1964 Seed List [4]. 1964; A. L. Moldenke, Phytologia 11: 70. 1964; Menninger, Seaside Pl. 213. 1964; Anon., Biol. Abstr. 45: B.120. 1964; D. S. Rao, Naturwiss. 52 (10): 262. 1965; Neal, In Gard. Hawaii, ed. 2, 729. 1965; Backer & Bakh., Fl. Java 2: 606. 1965; Liogier, Rhodora 67: 350. 1965; Anon., Biol. Abstr. 47: 2888. 1966; Moldenke, Phytologia 15: 77. 1967.

Additional & emended illustrations: Blanco, Fl. Filip. 2: pl. 227 [in color]. 1878; Brandis, Indian Trees 503. 1906.

Backer & Bakhuizen van den Brink (1965) describe this plant as follows: "Leaflets 3, glabrous or short-hairy on the midrib beneath (median one on a petiole of 3/4 -- 2 cm length), oblong or oblong-lanceolate, acute, 6--15 cm by 2 -- 5 1/2 cm, lateral ones somewhat shorter petioluled and smaller; petiole 2--10 cm. Panicles terminal and in the upper leaf-axils, rather lax, 5--20 cm long; bracts caducous, narrow; calyx-tube c. 2 mm; teeth distant, small; corolla-tube 5--6 mm; median segment of lower lip 3 1/2 -- 4 1/2 mm by 4--5 mm; ovary glabrous or shortly pubescent on the top; drupe glabrous or subglabrous. Tree or shrub. Native to the Philippines and the eastern part of Malesia; stated to have once been collected near Cheribon (W) [This statement needs confirmation]."

Menninger (1964) points out that "This Malasian evergreen tree with dense head and somewhat drooping branches, is sometimes known as V. littoralis Decne. This and V. leucoxylon L. grow on the seaside in India, according to Macmillan.... This should not be confused with V. altissima L. which also grows in India but never by the sea." Will describes it as a large tree, to 10 m. tall, densely branched. It has been collected in flower and

and fruit in December, the fruit described as black "berries" by Judd [actually they are drupes]. The corolla is described as "lilac" on A. A. Will s.n. and as "light-blue" on A. F. Judd s.n. The specific portion of the name *Vitex timoriensis* Walp. is often upcased.

The Alain 9967, distributed as *V. parviflora*, is actually *V. divaricata* Sw.

Additional citations: WESTERN PACIFIC ISLANDS: PHILIPPINE ISLANDS: Cabucan: Kondo & Edaño 8864 [Philip. Nat. Herb. 38834] (Bi). Luzon: S. Aguilar s.n. [Herb. Philip. Forest. Bur. 14333] (Bi); Alambra s.n. [Herb. Philip. Forest. Bur. 23086] (Bi); Cenabre & party s.n. [Herb. Philip. Forest. Bur. 28519] (Bi); Elmer 17286 (Bi); Haenke s.n. [Luzon, 1792] (Bi). Masbate: H. N. Whitford 1676 (Bi). Mindanao: Elmer 11031 (Bi), 13440 (Bi); Wenzel 2759 (Bi, Mi). Sibuyan: Elmer 10995 (Bi). MARIANA ISLANDS: Guam: R. V. Moran 4597 (Bi); Rodin 794 (W—1968683). POLYNESIA: HAWAIIAN ISLANDS: Oahu: A. F. Judd s.n. [Nov. 7, 1936] (Bi), s.n. [Dec. 10, 1938] (Bi). CULTIVATED: Florida: A. A. Will s.n. [27 Dec. 1961] (Fg). Hawaiian Islands: O. Degener 11243 (Bi); Degener & Park 9509 (Bi); Greenwell s.n. [O. Degener 19385] (Bi); A. F. Judd s.n. [Dec. 1, 1930] (Bi).

VITEX PARVIFLORA var. *PUBERULENTA* Moldenke

Bibliography: Moldenke, *Phytologia* 3: 489 (1951) and 6: 41—42. 1957; Moldenke, *Résumé* 185 & 477. 1959.

VITEX PARVIFLORA f. *STERILIS* H. J. Lam

Additional bibliography: Moldenke, *Phytologia* 8: 71. 1961.

Additional citations: WESTERN PACIFIC ISLANDS: PHILIPPINE ISLANDS: Luzon: H. H. Bartlett 14940 (Bi); Eder s.n. [Herb. Philip. Forest. Bur. 28569] (Bi); Fénix 3 (Bi). Mindanao: Elmer 14218, in part (Bi).

VITEX PATULA E. A. Bruce

Additional bibliography: G. Taylor, *Ind. Kew. Suppl.* 12: 151. 1959; Moldenke, *Phytologia* 8: 7. 1961.

VITEX PAYOS (Lour.) Merr.

Additional synonymy: *Allasia payos* Lour. ex Jacks. in Hook. f. & Jacks., *Ind. Kew.*, pr. 1, 1: 77, in syn. 1893. *Vitex payos* Merr. ex Watt & Breyer-Brandwijk, *Med. & Poison. Pl. S. Afr.*, ed. 2, 1055 & 1454. 1962.

Additional bibliography: Jacks. in Hook. f. & Jacks., *Ind. Kew.*, pr. 1, 1: 77 (1893) and 2: 1213. 1895; K. Schum. in Just, *Bot. Jahresber.* 28 (1): 497. 1902; Thiselt.-Dyer, *Ind. Kew. Suppl.* 2: 194. 1904; Prain, *Ind. Kew. Suppl.* 4, pr. 1, 248. 1913; A. W. Hill, *Ind. Kew. Suppl.* 9: 297. 1938; Jacks. in Hook. f. & Jacks., *Ind. Kew.*, pr. 2, 1: 77 (1946) and 2: 1213. 1946; Prain, *Ind. Kew. Suppl.*

4, pr. 2, 248. 1958; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 3, 1: 77 (1960) and 2: 1213. 1960; Cockbill, Rhod. Agric. Journ. 58: 173—177 & 370—373. 1961; Moldenke, Phytologia 8: 71—72. 1961; Cockbill, Weed Abstr. 11: 158 & 159. 1962; Watt & Breyer-Brandwijk, Med. & Poison. Pl. S. Afr., ed. 2, 1055 & 1454. 1962; Moldenke, Biol. Abstr. 37: 1062. 1962; Anon., Assoc. Etud. Tax. Fl. Afr. Trop. Index 1961: 60. 1962; Hocking, Excerpt. Bot. A.6: 534. 1963; H. P. Riley, Fam. Flow. Pl. S. Afr. 129. 1963.

Schumann (1902) places V. guerkeana Engl. in the synonymy of V. ferruginea Schum. & Thonn., a disposition with which I do not concur.

Recent collectors describe this plant as a tree, 5—12 m. tall, with a trunk 40—70 cm. in diameter at a height of 2—3 m., or as a shrub, 4 m. tall, growing in deciduous or open deciduous forests, open forests, open Brachystegia forests, in sandy soil, and in forests with Chlorophora excelsa, Cussonia arborea, and Sterculia appendiculata, in black sandy soil, at altitudes of 150—600 m., fruiting from January to March and in May, the fruit being edible. The corolla is described as "white, with a lilac lip" on F. A. Mendonça 1260. Additional vernacular names recorded for the species are "chicouvocica", "chicubo", "chicunvo", "meforra", "mefuvo", "mucuve", "nacuna", "namahature", and "purro".

Riley (1963) states that this plant provides the native people with sticks which are rubbed together to start fires; it is also used in the treatment of asthma and coughs. Cockbill (1961) reports that the species is resistant to the chemical brush killers used to control brush in areas cleared to check the spread of the tsetse fly.

Material has been misidentified and distributed in herbaria as var. glabrescens (Pieper) Moldenke. The F. A. Mendonça 1260 previously cited as deposited in my personal herbarium is now in that of the Texas Research Foundation at Renner, Texas.

Additional citations: RHODESIA: Leach 9693 (Mi). PORTUGUESE EAST AFRICA: Inhambane: Torre 2735 (Ul), 2748 (Ul). Manica e Sofala: Andrada 1042 (Ul); Barbosa 864 (Ul), 887 (Ul), 999 (Ul), 1280 (Ul); Garcia 135 (Ul); F. A. Mendonça 2624 (Ul, Z); Simão 232 (Ul), 318 (Ul); Torre 2781 (Ul), 3161 (Ul). Mozambique: Andrada 1458 (Ul); M. F. Correia 110 (Rf, Ul); Lemos & Macuácuá 17 (Ul); F. A. Mendonça 1260 (Ul, Z); Torre 1086 (Ul); Torre & Paiva 9278 (Ul), 11331 (Ul). Zambezia: Torre 4893a (Ul), 5369 (Ul), 5431 (Ul, Ul), s.n. [Nhamacurra] (Ul).

VITEX PAYOS var. GLABRESCENS (Pieper) Moldenke

Additional bibliography: Moldenke, Phytologia 8: 72. 1961.

Recent collectors have found this plant growing in forests of Brachystegia boehmii and B. spiciformis, at an altitude of 900 meters. The Lemos & Macuácuá 17, distributed as this variety, seems

to be better placed as typical V. payos (Lour.) Merr. in the fruiting stage. The pubescence on the variety is much shorter and finer than it is in the fruiting stage of the typical form of the species.

Additional citations: PORTUGUESE EAST AFRICA: Mozambique: Torre & Paiva 9903 (U1), 10479 (U1).

VITEX PAYOS var. STIPITATA Moldenke

Bibliography: Moldenke, *Phytologia* 8: 72. 1961; Moldenke, *Biol. Abstr.* 37: 1062. 1962; Anon., *Assoc. Etud. Tax. Fl. Afr. Trop.* Index 1961: 60. 1962; Hocking, *Excerpt. Bot. A.* 6: 534. 1963.

VITEX PAYOS var. ZAMBESIACA (J. G. Baker) Moldenke

Additional bibliography: K. Schum. in Just, *Bot. Jahresber.* 28 (1): 497. 1902; Thiselt.-Dyer, *Ind. Kew. Suppl.* 2: 194. 1904; Moldenke, *Phytologia* 6: 48. 1957; Moldenke, *Résumé* 151, 384, 391, & 477. 1959.

VITEX PEARSONII Pieper

Additional bibliography: Prain, *Ind. Kew. Suppl.* 3: 189. 1908; A. W. Hill, *Ind. Kew. Suppl.* 8: 249. 1933; Moldenke, *Phytologia* 6: 24 & 48—49. 1957; Moldenke, *Résumé* 151, 384, & 477. 1959.

VITEX PEDUNCULARIS Wall.

Additional synonymy: Vitex peduncularis "Wall. ex Schau." apud Anon., *Kew Bull. Gen. Index* 1929—1956, 293. 1959. Vitex pedunculata Wall. ex Moldenke, *Résumé Suppl.* 3: 42, in syn. 1962.

Additional & emended bibliography: Jacks. in Hook. f. & Jacks., *Ind. Kew.*, pr. 1, 2: 1213 & 1214. 1895; Craib, *Kew Bull. Misc. Inf.* 9: 443. 1911; Craib, *Contrib. Fl. Siam Dicot.* 164. 1912; Vaughan, *Brit. Med. Journ.* Feb. 5. 1921; Vaughan, *Indian Forester* 47: 286—288, pl. 9 & 10. 1921; Haines, *Bot. Bihar & Orissa* 4: 711 & 712. 1922; Gamble, *Fl. Madras* 6: 1102 & 1103. 1924; Chopra, Knowles, & Gupta, *Indian Med. Gaz.* 58: 133. 1925; Stapf, *Ind. Lond.* 6: 479. 1901; Fletcher, *Kew Bull. Misc. Inf.* 1938: 432 & 436. 1938; Worsdell, *Ind. Lond. Suppl.* 2: 501. 1941; Jacks. in Hook. f. & Jacks., *Ind. Kew.*, pr. 2, 2: 1213 & 1214. 1946; Bor & Raizada, *Some Beaut. Ind. Climbers* [136]. 1954; V. N. Sharma, *Journ. Sci. Ind. Research* 14b: 267. 1955; Rao & Venkiteswaralu, *Current Sci. India* 25: 328. 1956; Sharma, *Chem. Abstr.* 1956: 50. 1956; Karrer, *Konstit. & Vork. Organ. Pflanzenst.* 590. 1958; Anon., *U. S. Dept. Agr. Bot. Subj. Index* 15: 14362. 1959; Anon., *Kew Bull. Gen. Index* 1929—1956, 293. 1959; Jacks. in Hook. f. & Jacks., *Ind. Kew.*, pr. 3, 2: 1213 & 1214. 1960; Anon., *Bull. Bot. Surv. India* 2: 270—271. 1960; Moldenke, *Dansk Bot. Arkiv* 23: 92. 1963; Legris, *Trav. Sect. Scient. Inst. Franç. Pond.* 6: 201, 508, 516, & 586. 1963; Deb, *Bull. Bot. Surv. India* 5: 53. 1963; Panigrahi, Chowdhury, Raju, & Deka, *Bull. Bot. Surv. India* 6: 256. 1964; Chopra, Badhwar, & Ghosh, *Poison. Pl. India* 2: 695. 1965; D. S. Rao, *Naturwiss.* 52 (10): 262. 1965; Anon., *Biol. Abstr.* 47: 2888. 1966; H. Wagner in Swain, *Compar. Phytochem.* 310. 1966; T. Swain, *Compar. Phytochem.*

348. 1966; Moldenke, *Résumé Suppl.* 15: 9. 1967.

Emended illustrations: Vaughan, *Indian Forester* 47: pl. 9 & 10. 1921.

Recent collectors describe this plant as a shrub, 5 feet tall, or a small tree, the trunk to 1 foot in diameter, the leaves 3--5-foliolate, with oil glands which show as pellucid dots, the calyx dotted with golden scales or glands on the outside, the corolla covered with stiff white appressed hairs, and the fruit red, growing in thickets, deep forests, mixed deciduous forests with oaks, dry deciduous forests, dry deciduous forests dominated by Pentacme suavis, or open grassy oak-dipterocarp forests, at altitudes of 200--1365 m., flowering in April and July, fruiting in February and July, and called "awal". The corollas are described as "cream" on Kingdon-Ward 22162. It is said to be a common species in the deciduous forests of northern Thailand, but Panigrahi and his associates (1964) refer to it as "rare" in Orissa. Haines (1922) says "The form with winged petioles is called var. roxburghiana, but all seedlings have winged petioles and these persist sometimes to maturity."

Bor & Raizada (1954) tell us that this is "a common tree of Assam, contains a light yellow, crystalline substance which is identical with vitexin, the active principle of Saponaria officinalis and Vitex littoralis. Dr. S. Krishna (Biochemist, Forest Research Institute) informs us that the mature leaves of Vitex peduncularis lose their vitexin. In Assam a decoction of the leaves is always used in cases of black-water fever and many cases are reported to have been cured by its use. Its reputation is so great that a large quantity of seed and even seedlings have been sent from Assam to other provinces." Its distribution is given as Pakistan, India, and Burma to Indochina and Thailand.

Sharma (1956) reports that vitexin, $C_{15}H_{14}O_6$, is found in this species. Chopra, Badhwar, & Ghosh (1965) record the species from Bihar, Assam, Bengal, and Madras, and state that it contains traces of an alkaloid. An infusion of the leaves is locally esteemed as a cure for blackwater fever and malaria, but "it appears to be absolutely ineffective in the latter disease."

Additional citations: INDIA: Assam: Chand 2602 (M1); Koelz 25044 (M1), 28192 (M1). BURMA: Kingdon-Ward 22162 (Bm). THAILAND: Gram & Syrach-Larsen 48 (Cp).

VITEX PEDUNCULARIS var. ROXBURGHIANA C. B. Clarke

Additional bibliography: Roxb., *Fl. Ind.*, repr. ed. Carey, 482. 1874; Campbell & Watt, *Descrip. Cat. Econom. Prod. Chutia Nagpur* No. 9281; Jacks. in Hook. f. & Jacks., *Ind. Kew.*, pr. 1, 2: 1213. 1895; Haines, *Bot. Bihar & Orissa* 4: 711 & 712. 1922; Jacks. in Hook. f. & Jacks., *Ind. Kew.*, pr. 2, 2: 1213. 1946; Moldenke, *Phytologia* 6: 51--52. 1957; Moldenke, *Résumé* 159, 165, 166, 380, & 477. 1959; Jacks. in Hook. f. & Jacks., *Ind. Kew.*, pr. 3, 2: 1213. 1960.

VITEX PENTADACTYLA Velenovsky

Additional bibliography: Moldenke, *Phytologia* 6: 52—53. 1957; Moldenke, *Résumé* 227 & 477. 1959.

VITEX PENTAMERA Engelhardt

Additional bibliography: Moldenke, *Phytologia* 6: 53. 1957; Moldenke, *Résumé* 227 & 477. 1959.

VITEX PERRIERI Danguy

Additional bibliography: A. W. Hill, *Ind. Kew. Suppl.* 7: 252. 1929; Moldenke in Humbert, *Fl. Madag.* 174: 72, 91—93, & 273, fig. 12 (7—9). 1956; Moldenke, *Phytologia* 6: 53—54. 1957; Anon., U. S. Dept. Agr. Bot. Subj. Index 15: 14361. 1958; Moldenke, *Résumé* 157 & 477. 1959.

Illustrations: Moldenke in Humbert, *Fl. Madag.* 174: 91, fig. 12 (7—9). 1956.

VITEX PERVILLEI J. G. Baker

Additional bibliography: Jacks. in Hook. f. & Jacks., *Ind. Kew.*, pr. 1, 2: 1214 (1895) and pr. 2, 2: 1214. 1946; Moldenke in Humbert, *Fl. Madag.* 174: 72, 88—89, 91, & 273, fig. 12 (1 & 2). 1956; Moldenke, *Phytologia* 6: 54—56. 1957; Moldenke, *Résumé* 155, 157, & 477. 1959; Jacks. in Hook. f. & Jacks., *Ind. Kew.*, pr. 3, 2: 1214. 1960.

Illustrations: Moldenke in Humbert, *Fl. Madag.* 174: 91, fig. 12 (1 & 2). 1956.

VITEX PERVILLEI var. **PUBESCENS** Moldenke

Bibliography: Moldenke, *Phytologia* 3: 444—445. 1951; Moldenke in Humbert, *Fl. Madag.* 174: 72, 89, 91, & 273, fig. 12 (3 & 4). 1956; Moldenke, *Phytologia* 6: 56. 1957; Moldenke, *Résumé* 157 & 477. 1959.

Illustrations: Moldenke in Humbert, *Fl. Madag.* 174: 91, fig. 12 (2 & 3). 1956.

VITEX PETERSIANA Klotzsch

Additional bibliography: Jacks. in Hook. f. & Jacks., *Ind. Kew.*, pr. 1, 2: 1214. 1895; K. Schum. in Just, *Bot. Jahresber.* 28 (1): 497. 1902; Thiselt.—Dyer, *Ind. Kew. Suppl.* 2: 194. 1904; Jacks. in Hook. f. & Jacks., *Ind. Kew.*, pr. 2, 2: 1214 (1946) and pr. 3, 2: 1214. 1960; Moldenke, *Phytologia* 8: 72—73. 1961.

The Balsinhas 201, distributed as V. petersiana, is actually V. harveyana H. H. W. Pearson.

VITEX PETERSIANA var. **TETTENSIS** (Klotzsch) Pieper

Additional bibliography: Jacks. in Hook. f. & Jacks., *Ind. Kew.*, pr. 1, 2: 1214 (1895) and pr. 2, 2: 1214. 1946; Moldenke, *Phytologia* 6: 57. 1957; Moldenke, *Résumé* 151, 389, & 477. 1959; Jacks. in Hook. f. & Jacks., *Ind. Kew.*, pr. 3, 2: 1214. 1960.

VITEX PHAEOTRICHA Mildbr.

Additional synonymy: Vitex rufa A. Chev., Expl. Bot. Afr. Occid. Franç. 1: 507, hyponym. 1920; Hutchinson & Dalz., Fl. W. Trop. Afr., ed. 1, 2: 275. 1931. Vitex monrovia Pieper in Engl., Bot. Jahrb. 62, Beibl. 141 ["142"]: 44, 58, & 83. 1928; Fedde, Repert. Spec. Nov. 26: 163. 1929.

Additional & emended bibliography: A. Chev., Expl. Bot. Afr. Occid. Franç. 1: 507. 1920; A. W. Hill, Ind. Kew. Suppl. 6: 219. 1926; Pieper in Engl., Bot. Jahrb. 62, Beibl. 141 ["142"]: 44, 45, 58, 80, 83, & 84. 1928; Hutchinson & Dalz., Fl. W. Trop. Afr., ed. 1, 2: 275. 1931; Cooper & Record, Yale Univ. Sch. Forest. Bull. 31: 118 & 153, pl. 11. 1931; A. W. Hill, Ind. Kew. Suppl. 8: 249. 1933; Dalz., Useful Pl. W. Trop. Afr. 458. 1937; A. W. Hill, Ind. Kew. Suppl. 9: 297. 1938; Worsdell, Ind. Lond. Suppl. 2: 501. 1941; Moldenke, Known Geogr. Distrib. Verbenac., ed. 1, 46, 48, 101, 103, & 104. 1942; Moldenke, Phytologia 2: 122. 1944; Moldenke, Known Geogr. Distrib. Verbenac., ed. 2, 112, 114, & 202. 1949; Cavaco, Bull. Mus. Hist. Nat. Paris, ser. 2, 27: 91. 1955; C. & M. Goodnight, Biol. Abstr. 30: 1703. 1956; Anon., Assoc. Etud. Fl. Afr. Trop. Index 1955: 63. 1956; Moldenke, Phytologia 5: 484-485 (1957) and 6: 57-58 & 118-119. 1957; Anon., Biol. Abstr. 30: 4370. 1958; A. Fernandes, Mem. Soc. Broter. 13: 34. 1958; Aubrév., Fl. For. Cot. Iv., ed. 2, 3: 232, pl. 335, fig. 4-6. 1959; Moldenke, Résumé 137, 139, 477, & 478. 1959; G. Taylor, Ind. Kew. Suppl. 12: 151. 1959; Moldenke, Phytologia 8: 47, 64, & 79. 1961; Huber in Hutchinson & Dalz., Fl. W. Trop. Afr., ed. 2, 2: 445 & 447. 1963; Moldenke, Résumé Suppl. 15: 6, 7, & 25. 1967; Moldenke, Phytologia 15: 99 & 267. 1967.

Illustrations: Cooper & Record, Bull. Yale Univ. School Forest. 31, pl. 11 [as V. rufa]. 1931; Aubrév., Fl. For. Cot. Iv., ed. 2, 3: pl. 335, fig. 4-6. 1959.

Huber (1963) describes this plant as a forest tree, 40-45 ft. tall, with abundant long rust-colored indumentum, the inflorescence, petioles, lower leaf-surface, and young branches densely villous with long rust-colored, rust-red, or orange-brown hairs, the leaflets obovate, the central one 9-16 cm. long and 4-7.5 cm. wide, usually with 10-16 pairs of secondaries, and the flowers small, "white and purple". He cites the following specimens: SIERRA LEONE: Edwardson 221, Wallace S.L.F.D.74. LIBERIA: Baldwin 9155, G. P. Cooper 67, Dinklage 2194 & 3058, Harley 1480. IVORY COAST: Aubréville 4076, A. Chevalier 19712.

Dalziel (1937), along with Cooper & Record (1931), inform us that the fruits are oval, with a persistent disk-like fruiting-calyx, the wood is not very hard and is used in Liberia to make small "devil drums", rice bowls, tool handles, etc., and in native house construction. For the "devil drums" the bole is hollowed out. A lotion is made from the bark and leaves to wash ulcers. The species is known as "kpar-seh" in Liberia, as is also V. oxy-cuspis J. G. Baker and others of this genus.

The Dinklage 2194, distributed as this species and so cited by Huber, is actually V. congolensis DeWild. & Th. Dur.

VITEX PHASEOLIFOLIA Mildbr.

Additional & emended bibliography: A. W. Hill, Ind. Kew. Suppl. 7: 252 (1929) and 8: 249. 1933; Moldenke, Phytologia 6: 58--59. 1957; Moldenke, Résumé 139, 379, & 477. 1959.

VITEX PHILLYREAEFOLIA J. G. Baker

Synonymy: Vitex phillyraefolia J. G. Baker ex Moldenke in Humbert, Fl. Madag. 174: 115, sphalm. 1956.

Additional bibliography: Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 2: 1214 (1895) and pr. 2, 2: 1214. 1946; Moldenke in Humbert, Fl. Madag. 174: 75, 115--117, & 273, fig. 17 (4 & 5). 1956; Moldenke, Phytologia 6: 59. 1957; Moldenke, Résumé 157 & 477. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 3, 2: 1214. 1960; Moldenke, Résumé Suppl. 15: 25. 1967.

Illustrations: Moldenke in Humbert, Fl. Madag. 174: 115, fig. 17 (4 & 5). 1956.

VITEX PIERREANA Dop

Additional bibliography: A. W. Hill, Ind. Kew. Suppl. 9: 297. 1938; Moldenke, Phytologia 8: 73. 1961.

Additional citations: CHINESE COASTAL ISLANDS: Hainan: Lau 3649 (Bi), 3885 (Bi).

VITEX PIERREI Craib

Additional bibliography: A. W. Hill, Ind. Kew. Suppl. 6: 219. 1926; Fletcher, Kew Bull. Misc. Inf. 1938: 431 & 433. 1938; Annon., Kew Bull. Gen. Index 1929-1956, 293. 1959; Moldenke, Phytologia 8: 73. 1961.

Additional citations: THAILAND: Mrs. D. J. Collins 706 (Bi).

VITEX PINNATA L.

Additional & emended synonymy: Vitex bracteata Horsf. ex Miq., Fl. Ind. Bat. 2: 862, in syn. 1858. Vitex pubescens ptilota Dop ex Worsdell, Ind. Lond. Suppl. 2: 500. 1941. Tetrandra? paucidens Miq. ex Moldenke, Résumé Suppl. 4: 13, in syn. 1962. Vitex latifolia Auct. ex Backer & Bakh., Fl. Java 2: 606, in syn. 1965.

Additional & emended bibliography: N. L. Burm., Fl. Ind. 138, pl. 43, [fig. 2]. 1768; Hook., Bot. Misc. 285. 1830; W. Jack, Calc. Journ. Nat. Hist. 4 (13): 40. 1843; Hassk., 2e Cat. Lands Fl. Tuin Buitenz. 134. 1844; Bocq., Adansonia 3: [Rev. Verbenac.] 253. 1863; Beddome, Forester's Man. Bot. S. Ind. 171. 1873; H. O. Forbes, Wand. Naturforsch. Malay. Arch. 2: 226. 1886; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 2: 1213 & 1214. 1895; C. B. Clarke in J. Schmidt, Bot. Tidskr. 26: 173. 1904; Craib, Contrib. Fl. Siam Dicot. 164. 1912; E. D. Merr., Interpret. Rumph. Herb. Amboin. 292, 310, & 594. 1917; H. N. Ridl., Journ. Fed. Malay States Mus. 10: 111. 1920; E. D. Merr., Philip. Journ. Sci. 19: 331. 1921; Haines, Bot. Bihar & Orissa 4: 711. 1923; Gamble, Fl. Madras 6: 1102 & 1103. 1924; Stapf, Ind. Lond. 6: 478 & 479. 1931; Backer, Tectona 29: 691. 1936; Fletcher, Kew Bull. Misc. Inf. 1938: 432 & 435. 1938; Jacks. in Hook. f. & Jacks., Ind. Kew., pr.

2, 2: 1213 & 1214. 1946; Neal, In Gard. Hawaii, ed. 1, 643. 1948; Moldenke in Humbert, Fl. Madag. 174: 71, 77, 79, 119, 272, & 273, fig. 10 (1 & 2). 1956; Gilliland & Jabil, Proc. Sympos. Humid Trop. Veg. 62 & 64. 1958; Moldenke, Biol. Abstr. 32: 222. 1958; Anon., Kew Bull. Gen. Index 1929-1956, 293. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 3, 2: 1213 & 1214. 1960; Rosayro, Sympos. Impact Man Humid Trop. Veg. 287, 289, 300, & 301. 1960; Kosterm., Sympos. Impact Man Humid Trop. Veg. 337. 1960; Maun, Philip. Journ. Forest. 16: 108. 1960; Moldenke, Phytologia 8: 73-75. 1961; Satmoko, Malay. Nat. Journ. Spec. Issue 120. 1961; Hocking, Excerpt. Bot. A.5: 42. 1962; Legris, Trav. Sect. Scient. Inst. Franç. Pond. 6: 184, 192, 193, 197, 501, 508, 521, & 586. 1963; Santapau & Wagh, Bull. Bot. Surv. India 5: 109. 1963; Hegnauer, Chemotax. Pfl. 3: 39. 1964; Moldenke, Résumé Suppl. 10: 4. 1964; Neal, In Gard. Hawaii, ed. 2, 729. 1965; F. R. Fosberg, Govt. Sarawak Sympos. Ecol. Res. Humid Trop. Veg. 282. 1965; Mani, Bull. Bot. Surv. India 7: 114. 1965; Moldenke, Phytologia 14: 10 (1966) and 15: 88, 226, & 255. 1967; Moldenke, Résumé Suppl. 15: 25. 1967.

Additional illustrations: Moldenke in Humbert, Fl. Madag. 174: 79, fig. 10 (1 & 2). 1956.

Backer & Bakhuizen van den Brink (1965) describe this species as follows: "Leaflets 3--5, rather densely pubescent beneath at least on the nerves (median one on a petiolule of 2--8 mm length), ovate-elliptic-oblong, acute or obtuse, 8 -- 22 1/2 cm by 3 1/2 - 9 3/4 cm; following leaflets smaller, usually shorter-petioluled, 2 ultimate ones (in 5-foliate leaves) sessile or subsessile; petioles 3 1/2 -- 10 1/2 cm. Panicles terminal and in the upper leaf-axils, ovoid or pyramidal, dense, 8--25 cm long; bracts subpersistent, rather large (7--12 mm by 2--7 mm); calyx-tube 4--5 mm; teeth 1/2 -- 1 1/2 mm; corolla pale outside, blue-violet inside; tube 8--10 mm; median lobe of lower lip c. 10 mm by c. 8 mm; ovary glabrous; drupe globose, juicy, c. 3/4 cm diam. Tree..... mixed- and teak-forest, secondary forest, village-groves". They say, further, "In young trees the petiole is sometimes winged; such young trees have been misidentified as V. altissima L." [cfr. C. pinnata var. alata Moldenke].

The Vitex pinnata Burm. f. and V. pinnata Lour. are Aglaia odorata Lour. in the Meliaceae. Merrill (1921) regards V. pinnata L. as conspecific with V. altissima L.f., with which I do not agree.

Turczaninow's original (1863) description of V. inaequifolia is as follows: "V. caule ramisque tetragonis cum petiolis atque inflorescentia pubescentibus; foliis oppositis petiolatis; foliolis sessilibus ternatis, exterioribus minoribus, omnibus subellipticis obtusis vel acutiusculis saepe emarginatis, basi rotundatis vel parum attenuatis integerrimis, creberrime reticulatis, supra nitidulis ad nervationes tantum puberulis, subtus paulo magis vestitis; paniculis terminalibus folia non superantibus; bracteis spathulatis flores aequantibus; calyce acute 5-dentato, corolla duplo brevior. India orientalis, collectore ignoto."

Recent collectors describe this plant as a tree, 4--15 m. tall, the blaze yellow over tan, the branches pendulous, and the anthers black, flowering also in October, growing in rainforests, the margins of evergreen forests, and in tree and shrub islands by ponds. In Thailand it is said by King to grow "in open sun, cutover pastures at base of hill with shrubs and trees to 30 m. tall, the soil a thin dark gray clay over limestone."

The corolla is described as "white" on R. M. King 5499, "lavender to dirty-white" on R. M. King 5422, "pale purplish-white" on Boongird 22, and "upper lobes white, lower lobes violet-blue" on Harrison & Persaud 1551. There are wood vouchers accompanying R. M. King 5422 & 5499 and Toroos 364 & 1580.

Mani (1965) describes a gall made by Eriophyes cryptotrichus Nalepa on this plant; it is an epiphyllous, hemispheric, verrucose pouch gall, 0.5--5 mm. in diameter, and is his gall number 29.

The following bibliographic references are given for this species, but have not been traced or checked as yet by me: Jasper & Pirngadie, Batikkunst 47; Burg, Geneesheer 3: 163; Boorsma, Plantenstoffen 4: 110; Ridley, Mal. Timb. 84; Gamble 772.

Material has been misidentified and distributed in herbaria under various names. On the other hand, the Gram & Syrach-Larsen 110, distributed as V. pinnata, is actually V. longisepala King & Gamble.

Additional citations: BURMA: Dickason 6812 (Mi). THAILAND: Boongird 22 [Herb. Roy. Forest Dept. 2485] (W-2035011); Hansen & Smitinand 12186 (Cp); R. M. King 5422 (Du-502271), 5499 (Du-502286, Du-502292); K. Larsen 10029 (Lw); Larsen, Smitinand, & Warneke 1571 (Ac, Rf). WESTERN PACIFIC ISLANDS: PHILIPPINE ISLANDS: Balabac: S. Olsen 541 (Ac, Cp), 616 (Cp). Palawan: Elmer 12660 (Bi), 13004 (Bi). INDONESIA: GREATER SUNDA ISLANDS: British North Borneo: Elmer 20101 (Bi), 21095 (Bi). Kambangan: Collector indig. s.n. [7-6-09] (Bi). Sumatra: H. H. Bartlett 8738 (Mi, Mi); Toroos 364 (Mi, Mi), 1580 (Mi), 2367 (Mi); Yates 611 (Mi), 663 (Mi), 1267 (Mi). CULTIVATED: British Guiana: Harrison & Persaud 1551 (N). Hawaiian Islands: F. R. Fosberg 13625 (Bi); Korte s.n. [Nov. 2, 1953] (Bi); Rock 12603 (Bi, Bi, Bi, Bi, Bi), 12811 (Bi). Java: Herb. Hort. Bot. Bogor. XI.K.13 (Bi); E. D. Merrill s.n. [XIII.J.33] (W-438696).

VITEX PINNATA var. ALATA Moldenke

Additional bibliography: Moldenke, Phytologia 8: 75. 1961.

Backer & Bakhuizen van den Brink (1965) state that the winged petioled specimens of this species are merely from young trees. However, the type specimen of this variety was in fruit, so, even if young trees normally produce winged petioles, the condition apparently sometimes persists until the trees are sufficiently mature to produce flowers and fruit.

BOOK REVIEWS

Alma L. Moldenke

"Invertebrate Identification Manual" by Richard A. Pimentel, 151 pp., illus., Reinhold Publishing Co., New York City, N. Y. 10022. 1967. \$4.50

The sending of this paperback book to a botanical journal must have been due to some error; our inquisitive surveying of it led to our desire to keep it because it is written by a good naturalist, it is well illustrated by obvious line drawings, it covers the main visible groups of land, water and air invertebrates of North America usually only to families, and it is attractive to the amateur, the student and the field specialist in other organisms who cannot help wonder what these invertebrate neighbors are. In the fine introduction classification, phylogeny, photography, collecting techniques and preserving methods are described.

"Chemistry and Enzymology of Marine Algae Polysaccharides" by Elizabeth Percival & Richard H. McDowell, xii & 219 pp., illus., Academic Press, London W 1 & New York City, N. Y. 10003. 1967. 60 s. or \$12.00

Compactly and clearly the authors have organized the recent studies on the fine structure of these compounds throughout the algae with only minor emphasis on the commercially important derived alginates, agar, carrageenan, etc. They also report the studies of the effects of enzymes of various sources on these polysaccharides and of nucleotide biosynthesis from these sources.

This book is written for the trained biologist and/or chemist studying about or engaged in phycological research. It has excellent reference materials and index.

"The Wild Gardener in the Wild Landscape" - The Art of Naturalistic Landscaping by Warren G. Kenfield, xi & 232 pp., illus., Hafner Publishing Company, New York City, N. Y., & London, England. 1966. \$7.50

This new branch of vegetation management is defined as "a practical art involving the esthetic manipulation of plants and plant communities to form a pleasing whole" "appealing to the kind of person who likes wild nature, modified just a bit."

This type of gardening does not involve the use of bare soil into which plants are introduced, sprayed with toxic substances, manicured and fertilized constantly but rather it is largely involved with removing only unwanted plants and simply letting the remaining ones grow with very limited resort to fertilizers, poisons and meticulous time-consuming care. The limited work done may be manual or more efficiently the result of prudent herbicide

sculpturing. The chlorophenoxy chemicals are harmless to man and other animals; they decompose in the soil and serve as food for the microorganisms there.

This author's work may well be taken seriously because it bespeaks a lifetime of study and practice and a fine appreciation of beauty and art in nature. The book is provided with good color plates and not so good black-and-white ones of excellent examples of wild landscaping, fine line drawings, naturalization notes on family groups of several herbaceous plants suitable for the northeastern United States and similar parts of the world, references with critical remarks, and an index.

"Hortulus" by Walahfrid, translation by Raof Payne, commentary by Wilfrid Blunt, editor George H. M. Lawrence, xi & 92 pp., illus. Hunt Botanical Library, Pittsburgh, Penn. 15213 1966. \$12.00

This book is a gem of beauty, of early botany, of history, and of format. It opens with an account of "Walahfrid the Squint-eyed" monk who was born in 804 in Alemannia and is remembered even today primarily for his twenty-seven short poems composed in the calm of the Reichengau monastery garden. They were first entitled "De cultura hortorium" and later "Hortulus" or "The Little Garden".

Four medieval manuscripts exist, but none in Walahfrid's own hand. The facsimile reproduced here is from the Vatican library. It is followed by a transcription and a translation on facing pages, all with delicate accurate printings in soft green of the plants mentioned.

The book is enriched with valuable footnotes, references and an index.

"On a Piece of Chalk" by Thomas Henry Huxley, with introduction and notes by Loren Eiseley, 91 pp., illus. Charles Scribner's Sons, New York City, New York 10017. 1967. \$4.95

This is another gem of beauty, of 19th century evolutionary biology, and of format. This science classic was originally presented as a brilliant simple lecture to the working men of Norwich to demonstrate how the examination "of a bit of chalk which every carpenter carries about in his breeches' pocket" "may contain hundreds of thousands of these (fossil) bodies compacted together with incalculable millions of granules" revealing the dynamic story of earlier and related life.

The editor's notes are extremely valuable additions to the text as are the beautiful and accurate drawings of naturalist-artist Rudolf Freund, adding artistic as well as scientific value. Too frequently in a book of this type the author and/or publisher feel(s) that an index is not necessary; fortunately a good one is compiled for this book.

Because the now greatly expanded science of paleontology owes so much to the initial and brilliant efforts of Huxley for his

studies and his clarity of expression, this book should certainly be welcomed by a large reading public.

"The Oxford Book of Flowerless Plants" by Frank H. Brightman (text) and B. E. Nicholson (illustrations), viii & 208 pp., illus. Oxford University Press, New York City, New York 10016, and London W.1, England. 1966. \$10.00

In the format of the other books in this series (wild flowers, garden flowers, birds) there are almost a hundred accurate and beautifully colored plates of over 250 fungi, almost a hundred sea weeds, many lichens, liverworts, mosses and ferns with concise descriptive text on the opposing pages. These are the cryptogams found commonly in the British countryside and grouped on the plates in characteristic ecological or natural association patterns.

The lovely plates will probably whet the appetites of naturalist-inclined readers to pursue these lovely forms in nature, and they will also lead to easy identification for the field naturalist who is fortunate enough to come upon this book.

Scientific names are always given, common names appear frequently. There is a useful index.

"The Illustrated Flora of Illinois - FERNS" by Robert H. Mohlenbrock, xv & 191 pp., illus. Southern Illinois University Press, Carbondale & Edwardsville, Illinois, and Feffer & Simons, Inc., London & Amsterdam. 1967. \$8.00

This work is the first of a projected multivolumed flora of the state covering every group of plants under the editorship of this author. He and specialists are preparing the additional volumes which will be run off the presses in the order in which the texts are completed. Eighty species of ferns and fern allies are treated in this volume with an excellent introduction, illustrated vegetative and "fruiting" keys to genera, then species descriptions and illustrations. Here are given synonymy, common name(s), habitat, range, Illinois distribution on a dotted county map, and items of special interest. The keys are easily managed because of the use of clearcut, nontechnical language wherever possible, and clearcut illustrations of technical terms wherever needed.

Maybe many of the wildflower enthusiasts will marvel at the author's statement that "Perhaps no other group of plants attracts more interest among amateur botanists than ferns," but fern enthusiasts will agree happily.

Because the print is so readable, the drawings so obvious, and the size so handy, this book should prove a great asset to the amateur, the student and the botanist. It is a fine harbinger of what is to come in the succeeding volumes.

The price seems unusually high.

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2

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FLORA

OF THE

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A HANDBOOK

TO THE FLORA OF THE PROVINCES OF
MANITOBA, SASKATCHEWAN AND ALBERTA

by

BERNARD BOIVIN

Herbier Louis-Marie, Université Laval
and Department of Agriculture, Ottawa

Part I

Pteroids, Ferns, Conifers and

Woody Dicotyledons

(continued)

- b. Leaves entire Group 1-B
 bb. Dentate to lobed Group 1-C

Group 1-A

Small semi-shrubs with opposite or verticillate leaves.

- a. Leaves opposite and crowded or strongly overlapping.
 b. Peduncle bearing 3 bracts ... 43. Diapensiaceae, p. 171
 bb. No bracts 39. Ericaceae p. 153
 aa. Internodes well developed; leaves all or in part verticillate or subverticillate.
 c. Leaves dentate 41. Pyrolaceae, p. 168
 cc. Leaves entire.
 d. Leaves mostly basal or near basal, the stem rather scapose with a verticill of leafy bracts subtending the inflorescence Eriogonum, part II
 dd. Stem leafy, no basal leaves.
 e. All leaves opposite or verticillate 27. Cornaceae, p. 137
 ee. Leaves part alternate, part verticillate in 4's .. 44. Empetraceae, p. 172

Group 1-B

Trees or shrubs with opposite and entire leaves. At least 3 dm high.

- a. Densely stellate-pubescent, at least on the lower leaf surfaces 49. Elaeagnaceae, p. 176
 aa. Leaves glabrous or with a different pubescence.
 b. Flowers and fruits geminate Lonicera, p. 190
 bb. Each flower its own peduncle.
 c. Flowers all or mostly in axillary clusters Symphoricarpos, p. 189
 cc. Inflorescence terminal.
 d. Leaves strongly revolute or very small 39. Ericaceae, p. 153
 dd. Leaves flat, large.
 e. Inflorescence a compound corymb or panicle.
 f. Leaves nearly deltoid and more or less truncate or subcordate at base.. Syringa, p. 179
 ff. Narrower and cuneate to rounded at base...27. Cornaceae, p. 137
 ee. Inflorescence a bractless raceme..... 26. Hydrangeaceae, p. 136

Group 1-C

Trees or shrubs with the leaves variously toothed or lobed.

- a. Leaves palmately lobed.

LIGNIDAE

40

- b. Petals white; fruit a berry Viburnum, p. 188
- bb. Petals inconspicuous, fruit a samara..
..... 50. Aceraceae, p. 195
- aa. Leaves dentate or serrulate.
 - c. Spinescent, the lateral branches ending
in a sharp point 48. Rhamnaceae, p. 175
 - cc. Not spinescent.
 - d. Inflorescence a terminal raceme of
opposite flowers 26. Hydrangeaceae, p. 136
 - dd. Flowers not racemose ... 55. Caprifoliaceae, p. 187

Group 2

Leaves compound, opposite or verticillate.

- a. Shrub climbing by its twining petioles... Clematis, part II
- aa. Not climbing.
 - b. Trees producing samaras.
 - c. Leaflets coarsely few-toothed....
..... 50. Aceraceae, p. 195
 - cc. Leaflets finely serrate 51. Oleaceae, p. 178
 - bb. Shrubs producing berries.... 55. Caprifoliaceae, p. 187

Group 3

Leaves alternate, compound.

- a. Climbing vine with large digitate leaves ..
..... 50. Vitaceae, p. 177
- aa. Not climbing.
 - b. Semi-woody and only 1-3 dm high; leaves
more or less ternately divided.
 - c. Leaves biternately pectinate Luetkea, p. 47
 - cc. Leaf divided in 3-5 leaflets.
 - d. Leaflets entire or coarsely and
irregularly few-toothed
..... 59. Anacardiaceae, p. 197
 - dd. Leaflets serrate or 3-toothed
at apex 15. Rosaceae, p. 45
 - bb. Taller and obviously woody.
 - e. Leaflets coarsely toothed, each
tooth ending in a spine Berberis, part II
 - cc. Leaflet margin not spiny.
 - f. Petiole without stipule
..... 59. Anacardiaceae, p. 197
 - ff. Petiole with a pair of free
or partially adnate stipules.
 - g. Leaflets variously
toothed 15. Rosaceae, p. 45
 - gg. Leaflets entire.
 - h. Leaflets 5-7 Potentilla, p. 55
 - hh. Leaflets much more
numerous 16. Leguminosae, p. 71

Group 4

Climbers with simple alternate leaves.

- a. Leaf peltate, pentagonal..... 65. Menispermaceae, part II
- aa. Not peltate.
 - b. Climbing by twining stems.
 - c. Leaves serrulate 45. Celastraceae, p. 172
 - cc. Leaves entire or lobed..... 93. Sclanaceae, part III
 - bb. Climbing by tendrils 50. Vitaceae, p. 177

Group 5

Leaves alternate, simple and entire. Non-climbers.

- a. Abundantly stellate-pubescent, especially on the lower surface of leaves 49. Elaeagnaceae, p. 176
- aa. Pubescence, if present, not stellate.
 - b. Densely spiny-branched Sarcobatus, part II
 - bb. Not spiny.
 - c. Semi-shrubby, with numerous herbaceous shoots from a woody base; nearly all leaves not developing any wintering bud.
 - d. Creeping shrub with single terminal long peduncled flower Dryas, p. 66
 - dd. Inflorescence more elaborate.
 - e. Flowers in glomerules 78. Chenopodiaceae, part II
 - ee. Flowers in involucreted heads..... Artemisia, part III
 - cc. Shrubs or trees. Main leaves usually developing an axillary winter bud.
 - f. Small lanate leaves 1.0-3.5 mm long 29. Cistaceae, p. 139
 - ff. Leaves larger.
 - g. Leaves part alternate, part verticillate..... 44. Empetraceae, p. 172
 - gg. Leaves all alternate or tufted Group 5-A

Group 5-A

Remainder of group 5 with alternate or tufted leaves, neither very small nor stellate. Clearly woody shrubs or trees; not spiny.

- a. Leaves persistent, coriaceous, often revolute.
 - b. Ovary superior 39. Ericaceae, p. 158
 - bb. Ovary inferior 40. Vacciniaceae, p. 165
- aa. Leaves deciduous.
 - c. Bud covered by a single hooded scale.. 17. Salicaceae, p. 105
 - cc. Buds with 2 or more scales (or naked).

- d. Leaves mostly tufted, with one large leaf and 2 or more very small ones in each tuft Lycium, part III
- dd. Leaves all or mostly alternate, not tufted.
 - e. Small stipules present, persisting all summer Cotoneaster, p. 48
 - ee. No stipules.
 - f. Inflorescence a terminal corymb 27. Cornaceae, p. 137
 - ff. Flowers axillary or racemose.
 - g. Flowers solitary or in bracted racemes
 - 40. Vacciniaceae, p. 165
 - gg. Flowers in axillary cluster of 2-8 flowers.
 - h. Clusters borne on the new shoot, in the axil of a leaf
 - 48. Rhamnaceae, p. 175
 - hh. Borne on the older and leafless wood, at last year's nodes...
 - Rhododendron, p. 160

Group 6

Leaves alternate, simple, not entire. Non-climbers.

- a. Leaves lobed to deeply dissected.
 - b. Leaf pectinately divided Artemisia part III
 - bb. Cut into coarser lobes.
 - c. Leaf lyrate 21. Fagaceae, p. 130
 - cc. Leaf palmately lobed.
 - d. Carpels free; flowers corymbose to solitary 15. Rosaceae, p. 45
 - dd. Ovary compound; flowers racemose to solitary 25. Grossulariaceae, p. 133
- aa. Leaves merely toothed or serrate.
 - e. Various spiny.
 - f. Leaf fascicles subtended by spines usually three-pronged Berberis, part II
 - ff. Well armed with spinescent short lateral branches.
 - g. Leaves subopposite towards the end of the branches 48. Rhamnaceae, p. 175
 - gg. Leaves alternate 15. Rosaceae, p. 45
 - ee. Not spiny Group 6-A

Group 6-A

Remainder of group 6, spineless and the leaves merely serrate or dentate.

- a. Low shrubs, less than 2 dm high.
 - b. Flower solitary on a long peduncle and conspicuously overtopping the foliage Dryas p. 66
 - bb. Not solitary, or at least overtopped by the foliage.
 - c. Ovary inferior 40. Vacciniaceae p. 165
 - cc. Ovary superior.
 - d. Bud covered by a single scale Salix p. 108
 - dd. Bud showing more than one scale.
 - e. Petals free; flowers in a terminal corymb Chimaphila p. 168
 - ee. Fused; inflorescence nearly always different 39. Ericaceae p. 158
- aa. Taller shrubs and trees.
 - f. Leaves strongly asymmetrical at base.
 - g. Leaf with 3 conspicuous main nerves 35. Tiliaceae, p. 151
 - gg. Leaf with a single main nerve ..22. Ulmaceae, p. 131
 - ff. Leaves not particularly asymmetrical at the base.
 - h. Flowers with showy petals, not in catkins.
 - i. Petals hooded Ceanothus, p. 176
 - ii. Petals flat 15. Rosaceae, p. 45
 - hh. Flowers in catkins, lacking petals.
 - j. Inflorescence compound, a spike or raceme of catkins.
 - k. Leaves oblanceolate, toothed near the top only... 18. Myricaceae, p. 124
 - kk. Leaves broader and more toothed 19. Betulaceae, p. 124
 - jj. Catkins not in compound inflorescences.
 - l. Leaves all alternate, with a bud produced in each axil.
 - m. Leaves evenly and simply serrate or crenate.... 17. Salicaceae, p. 105
 - mm. Denticulation very uneven and more or less double.. 20. Corylaceae, p. 129
 - ll. Leaves alternate on the leading shoots, clustered on the short lateral shoots, the latter with a single terminal bud..... 19. Betulaceae, p. 124

Order 8. ROSALES

Flowers perfect and normally 5-merous. Sepals fused, but petals free. Carpels mostly free.

- a. Flowers regular, carpels mostly numerous 15. Rosaceae
- aa. Flowers papilionaceous, carpel solitary
..... 16. Leguminosae, p. 71

15. ROSACEAE (ROSE FAMILY)

Receptacle usually well developed, with the floral appendages peripheral. Flowers regular and conspicuous, with the stamens usually in multiples of 5. Carpels often very numerous, usually free. Stipules present, usually conspicuous.

We have been unable to substantiate any of the various reports of *Sanguisorba canadensis* L. in the interval between Quebec and British Columbia. No specimens at CAN, DAO, HUM, NY, OK, TRT, etc.

- a. Leaves simple, entire to lobed; plants woody to semi-shrubby Group A
- aa. Leaves more deeply dissected.
 - b. Leaves simple, deeply divided into linear lobes.
 - c. Biennial herb 12. *Chamaerhodos*, p. 63
 - cc. Trailin- semishrub 3. *Luetkea*, p. 47
 - bb. Leaves compound Group B

Group A

Leaves entire to lobed.

- a. Flower solitary at the end of a very long peduncle; petals and calyx lobes about 8 14. *Dryas*, p. 66
- aa. Petals and calyx lobes about 5; flowers usually more numerous.
 - b. Low semi-herbaceous plants, less than 3 dm high 9. *Rubus*, p. 52
 - bb. Taller shrubs or trees.
 - c. Coarsely spiny.
 - d. Spines leafy the first year ... 17. *Prunus*, p. 70
 - dd. Spines leafless 8. *Crataegus*, p. 51
 - cc. Not spiny.
 - e. Leaves lobed.
 - f. Calyx stellate-pubescent... 1. *Physocarpus*, p. 42
 - ff. Pubescence not stellate 9. *Rubus*, p. 52
 - ee. Leaves entire, serrate or toothed.
 - g. Stipules lacking; fruit a group of dry follicles 2. *Spiraea*, p. 42
 - gg. Stipules present; fruit fleshy.
 - h. Fruit superior; carpel solitary 17. *Prunus*, p. 70
 - hh. Ovary inferior; carpels 2-5.
 - i. Leaves entire.. 5. *Cotoneaster*, p. 48
 - ii. Leaves serrate or dentate.
 - j. Ovary 10-locular; flowers racemose.. 7. *Aelaeagnus*, p. 50
 - jj. Ovary 2-5 locular; inflorescences various 6. *Pyrus*, p. 48

Group B

Leaves compound.

- a. Calyx double, with an outer set of 5 lobes termed calyculæ and an inner ring of 5 broader lobes forming the calyx proper.
 - b. Fruit fleshy; stemless plant with trifoliate leaves 10. Fragaria, p. 54
- bb. Fruit not fleshy; leaves various.
 - c. Style short and more or less deciduous, not elongating in fruit ... 11. Potentilla, p. 55
 - cc. Style many times longer than the achene, strongly geniculate or plumose 13. Geum, p. 64
- aa. Calyx simple, of 5 lobes.
 - d. Stipules adnate to the petiole for most of their length; usually a very spiny shrub 16. Rosa, p. 67
 - dd. Stipules free or nearly so.
 - e. Ovary (and fruit) with a ring of hooked prickles 15. Agrimonia, p. 67
 - ee. No hooked prickles on fruit.
 - f. Herb with pinnate leaves 4. Sorbaria p. 47
 - ff. Shrubs or trees.
 - g. Shrubs, mostly with trifoliate leaves 9. Rubus, p. 52
 - gg. Small trees; leaves pinnate 6. Pyrus, p. 48

Tribe 1. SPIREAE

Fruit a group of follicles. Shrubs, sometimes only semi-shrubby.

1. PHYSOCARPUS Max.

NINEBARK

Follicles dehiscent along both sutures. Shrubs with stellate pubescent calyces.

1. P. malvaceus (Greene) Kuntze -- Shrub, 1-2 m high, with exfoliating bark. Leaves ovate to cordate, mostly 3-lobed and ± doubly serrate. Flowers white in a stellate-tomentose terminal corymb. Waterton. -- Alta-BC, US.

2. SPIRAEA L.

MEADOW-SWEET

Follicles dehiscent along ventral suture only. Leaves without stipules. Semishrubs.

- a. Flowers in a narrow panicle 1. S. alba
- aa. Flowers in a corymb.
 - b. Flowers white 2. S. betulifolia
 - bb. Flowers pink 3. S. densiflora

1. S. alba Dulac var. alba (S. latifolia A.; S. salicifolia A.) -- Meadow-Sweet (The de Canada) -- Semishrub from a woody base, the numerous erect shoots biennial. Leaves \pm lanceolate. Flowers white. Inflorescence finely puberulent, terminating the stem on the first year, or the branches the second year. First half of the summer. Wet open places. -- Q-Alta, US, Eur -- Var. latifolia (Aiton) Boivin -- Inflorescence glabrous. Leaves broader, narrowly obovate to broadly oblanceolate. Cypress River. -- (L)-MF-SPM, MS-Man, US, Eur.

There is a gradual transition from var. alba to var. latifolia. It is noteworthy that in eastern Saskatchewan and adjacent Manitoba some intermediates occur although typical var. latifolia is absent from the region.

2. S. betulifolia Pallas var. lucida (Douglas) C.L. Hitchc. -- Semishrub with the numerous erect shoots usually annual and simple. Plant glabrous or merely ciliolate. Leaves ovate, serrate to coarsely toothed. Flowers white in terminal corymbs. Sepals deltoid. Rocky slopes, open to slightly wooded. Mid-summer. Rockies and Cypress Hills. -- S-BC, US.

Capsules in our variety are glabrous or ciliolate on the sutures. Reputedly barely distinct from the east asian var. betulifolia, the latter having pubescent fruits and less coarsely toothed leaves.

3. S. densiflora Mutt. var. splendens (Baumann) C.L. Hitchc. -- Similar to the preceding but the flowers pink in much narrower corymbs. Leaves serrate to serrulate. Calyx lobes triangular. (Early summer?) Subalpine meadows and swampy shores: Waterton. -- swAlta, US.

All the B.C. material examined is glabrous or merely ciliate on the leaves and bracts and belongs to typical var. densiflora, while all the Waterton specimens were lightly puberulent in the manner of var. splendens, mainly in the inflorescence, on the twigs and on the lower face of the leaves.

3. LUETKEA Bongard

Follicules stipitate, dehiscent ventrally and partly also dorsally. Semishrubs.

1. L. pectinata (Pursh) Kuntze -- Partridge-Foot -- Mat-forming from its extensive woody rhizomes. Stems herbaceous, erect, 5-15 cm high. Leaves biternately cleft into narrow lobes, mostly gathered in a basal rosette. Flowers white, in a terminal raceme. Mid summer. Wet places and snowpatches, mostly around timberline. Rockies. -- swY-sAka, swAlta-BC, nw US.

4. SORBARIA Braun

As in Spiraea but the leaves pinnate and stipulate.

1. S. SORBIFOLIA (L.) Braun -- Leaves pinnate, with persistent stipules about 1 cm long. Leaflets lanceolate, doubly serrate, caudate. Flowers white, in a terminal panicle. Summer. Cultivated and casually escaped or persistent. -- MF, MS-O, Alta, US, Eur.

The mention of Clearwater Lake, Sask., by Breitung 1957, was discussed by W.J. Cody, Can. Field-Nat. 76: 101-7. 1962. The site was revisited in 1960; no local evidence of this plant was detected and the local climate did not seem very propitious to its spread.

Tribe 2. POMEAE

Ovary inferior; the fruit a pome. Shrubs or trees.

5. COTONEASTER

Much as in Crataegus, the fruit a small pome containing hard, bony, one-seeded carpels, but at flowering time each carpel contain 2 fertile ovules. Ours are non-spiny shrubs with entire leaves and black fruits.

- a. Young shoots and lower surface of young leaves yellowish tomentose, becoming merely pubescent at maturity1. C. acutifolia
- aa. Tomentum white, denser, the leaves remaining tomentose below at maturity2. C. melanocarpa

1. C. ACUTIFOLIA Turcz. -- (Cotonnière) -- A shrub with leaves and branches two-ranked and disposed in flat sprays. Leaves about 3-4 cm long, ovate, dark green above, much paler below, entire, broadly acute at tip; young leaves covered below with a butter yellow to rusty yellow tomentum which becomes much laxer at maturity. Short shoots with smaller leaves and a small corymb of flowers. Stipules brownish to blackish, partly adnate to the petiole, persisting all summer. Fruit black, usually solitary, with 2 nutlets. (Early summer?). Cultivated and sometimes tending to spread into the neighbouring bush: Fort Garry, Brandon, Pointe-du-Bois, Saskatoon and Edmonton. -- O-Alta, (Eur).

2. C. MELANOCARPA Lodd. -- Quite similar, but the tomentum denser, pure white, more persistent. A somewhat smaller shrub with the leaves broadly acute to rounded at tip and the fruit with 3-4 nutlets. (Early summer?). Long persistent after cultivation: Brandon. -- Man, Eur.

6. PYRUS

Small trees or shrubs with a small or large pome as a fruit. The carpels are imbedded in the flesh and have cartilaginous walls; they usually contain two seeds or pips. Flowers white, in umbells or corymbs.

- a. Leaf simple 1. P. Malus
- aa. Leaf pinnate.
 - b. Buds, inflorescence and lower surface of leaflets more or less lanate 2. P. Aucuparia
 - bb. Leaflets glabrous or nearly so below; buds glabrous to ciliate.
 - c. Leaflets serrate only 1/2 to 3/4 of

their length; rusty pubescence on new shoots and in the inflorescence ... 4. P. sitchensis
cc. Leaflets serrate to near the base; pubescence clear or white 3. P. americana

1. P. MALUS L. (Malus pumila Miller) -- Apple-Tree (Pommier, Pommier sauvage) -- A small tree commonly planted for its fruit. Leaves broadly ovate, serrate, alternate on the leading shoots, tufted on the fragile short shoots. Flowers white to pinkish in showy clusters on the short shoots. Fruit, the well known APPLE. Mid spring. Planted and very long persistent, sometimes sprouting from discarded pips. -- MF-(SPM), NS-Man, (BC, US), Eur.

2. P. AUCUPARIA (L.) Gaertner (Sorbus Aucuparia L.) -- Rowan-Tree, Mountain-Ash (Cormier, Sorbier) -- A small tree planted for its showy flowers and persistent fruits which attract winter birds. Leaves part alternate, part clustered at the end of shoots, pinnately divided into 9-17 oblong to lanceolate leaflets, more or less villous-lanate below, especially along the midnerve, often nearly glabrous in age. Young twigs tomentose to white-villous. Inflorescence a wide corymb, white-villous, becoming nearly glabrous and pendent by mid summer. Late spring. Planted and sometimes reseeding itself in nearby bush. -- Aka, (L), NS-O, S-BC, US, Eur.

A European var. glabrata Wimm. & Graebn. is glabrous or nearly so and its leaflets are narrower and more acute, forming a transition to our P. americana.

3. P. americana (Marsh.) DC. var. decora Sarg. (P. scopulina (Greene) Longyear; Sorbus decora (Sarg.) Schneider; S. scopulina Greene) -- Dogberry, Mountain-Ash (Maskouabina, Cormier) -- A shrub or small tree with alternate pinnate leaves, quite similar to the preceding and easily confused with it. Much less pubescent, only lightly villous and often quite glabrous. Outer bud scales ciliate and usually glabrous or nearly so dorsally. Young twigs lightly villous. Leaflets oblong to lanceolate. Inflorescence lightly villous, remaining erect at maturity. Early summer. Widely scattered in regions of coniferous forests, including the Cypress Hills. -- sG, seK-Aka, L-SPM, NS, NB-BC.

Sorbus decora and S. scopulina are commonly treated as different species separated by a wide distributional gap and a more tenuous morphological one. The distributional gap is non-existent and the morphological one not convincing. Certainly the leaflets of the average eastern specimen are not stubbier than those of the western ones. And if label indications are to be relied upon, the western shrub is 1-4 m high while the eastern one is mostly 2-3 m high with the odd sheltered individual reaching up to 6 m.

The more southern and eastern var. americana is commonly taller, has more elongate and more acuminate leaflets and a smaller pome.

Reports of Sorbus americana from Manitoba were based partly on specimens since revised to var. decora, partly on a specimen

from "M.A.C.", that is "Manitoba Agricultural College" and presumably planted as a sometimes ornamental.

Our interpretation of the name Sorbus americana Marsh. is at variance with a discussion of its application by Jones 1953. We are not satisfied that Sorbus americana W. "in montibus excelsis carolinae" should be interpreted in the sense of the more northern S. decora which does not occur in the Carolinas. More satisfactory would be the equivalence of S. americana W. and S. americana Marsh., the latter being the only species known to occur in the mountains of Carolina. Now Pursh described his Sorbus americana with an unequivocal reference to S. americana W. and there seems to be no sound justification to deal with Pursh's publication as if he had intended to present a new entity in no way related to earlier publications. The nomenclature adopted herewith is based on our contention that Sorbus americana remains the same nomenclatural entity from Marshall to Pursh, regardless of successive taxonomic accretions and misapplications.

4. P. sitchensis (Roemer) Piper (P. occidentalis Watson; Sorbus occidentalis (Watson) Greene; S. sitchensis Roemer, var. Grayi (Wenzig) C.L. Hitchc.) -- Mountain-Ash -- Quite similar to the preceding, but lower and shrubby, 1-3 m high. Pubescence of the buds, young twigs and inflorescence partly or entirely rust-coloured. Leaflets oblong to lance-oblong, entire in the lower 1/3 or so, often less numerous, commonly 9 or 11 per leaf, rounded at tip. (Late spring?). Light woods: Rockies. -- sAka, Alta-BC, nwUS.

Reaches as far north as Lake Bennett on the BC-Yukon boundary. There is no evidence that Dawson's collection from Lake Bennett comes from the Yukon side of the border. To include Yukon in the distribution of this species is not fully justified at this stage.

Specimens with less toothed leaflets, entire in the lower half, are often separated as P. occidentalis. The material examined showed neither morphological discontinuity nor geographical restriction for this phenotype.

7. AMELANCHIER Med.

JUNE-BERRY

Fruit a saskatoon, that is a small dark blue pome with the five carpels divided by false cartilaginous partitions into a total of 10 locules, each containing a seed. Otherwise much like Pyrus except that the leaves are always simple. Ours have racemose inflorescences.

- a. Pedicels short, mostly less than 1 cm. 1. A. alnifolia
- aa. Longer, the lowest usually 1.5 cm or more.
 - b. Leaves floccose below at flowering time; obtuse or rounded at tip, mostly mucronulate 2. A. sanguinea
 - bb. Leaves glabrous or nearly so at flowering time, rounded or truncate at tip, mostly not mucronulate 3. A. florida

1. A. alnifolia Mutt. -- Saskatoon (Poire, Saskatons, Bois de flèche) -- A common colonial shrub, up to 3 m high, showy in spring with its racemes of white flowers and its white or yellowish tomentose folded leaves. Leaves ovate or oblong, serrate, often squarish, rounded or more often truncate at tip. Pedicels 5-10-(13) mm long. Petals 6-9 mm long. Sepals 2.5-3.0 mm long. Fruit dark bluish purple, edible, the well known saskatoon. First half of spring. Around bluffs, along watercourses, in small draws, etc. General. -- Mack-Aka, sw Q-BC, US -- F. alba Nielsen -- Fruits whitish at maturity. -- S-Alta, (US).

2. A. sanguinea (Pursh) DC. (A. humilis Wieg.) -- Indian-Pear (Petites Poires, Poirier) -- Generally similar to the preceding, the pedicels of more uneven length, the lowest usually 15 mm or more. Leaves white floccose below at flowering time, mostly obtuse or rounded and mucronulate at tip. Sepals 3-4 mm long. Petals 8-20 mm long. (Mid spring?). Openings and margins of woods. Southeastern Manitoba. -- seK, NF, NS-Man, US.

The taxonomy of this genus is currently quite controversial and A. sanguinea is one of the more controversial species, being sometimes subdivided into as much as seven phenotypes: A. amabilis Wieg., A. gaspensis (Wieg.) Fern. & Weath., A. humilis Wieg., A. huronensis Wieg., A. mucronata Nielsen, A. sanguinea (Pursh) DC. and A. Wiegandii Nielsen.

3. A. florida Lindley -- Also generally similar, also with long pedicels, the lower usually 15 mm long or more, but the leaves glabrous or nearly so at flowering time, mostly broadly rounded or truncate at tip and often rather coarsely serrate. Sepals 3-5 mm long. Petals 10-15 mm long. Mid spring to early summer. Mostly in river valleys and rather local. Cypress Hills, Rockies and Northern Alberta. -- sMack, (sAka), S-BC, US.

8. CRATAEGUS L.

HAWTHORN

Shrubs with rather coarse woody spines. Fruit a middle size pome with 2-5 stone-hard pips, these being the mature carpels.

- a. Spines 1.5-2.5 cm long; fruit dark blue or purple black 3. C. Douglasii
- aa. Spines mostly much longer; fruit scarlet.
 - b. Larger teeth rather coarse, acute and acuminate; no ventral cavities 1. C. rotundifolia
 - bb. Teeth of the larger series low, obtuse, not acuminate; ventral cavities present 2. C. succulenta

1. C. rotundifolia Moench (C. chrysocarpa Ashe; C. columbiana AA.) -- Hawthorn (Cenelles) -- A large shrub, with the biggest woody thorns. Up to 4 meters high and stoloniferous, forming quite impenetrable clumps with numerous thorns 2-6 cm long and usually falcate. Leaves doubly serrate, with a purple black gland at the end of each tooth. Flowers white in showy corymbs. Fruit scarlet, often pruinose, obovoid, about 1 cm long or slightly

longer. Stones flat on the faces. Mid-spring. Inside bluffs, along ravines and near watercourses. General. -- (NF), NS-Alta, US.

The comment under Amelanchier sanguinea applies equally well here. About 1000 species of Crataegus have been described for North America and most known permutations of a limited number of morphological characteristics have been decorated with a binomial. Our concept of C. rotundifolia includes some 10-12 "species" of some other current floras. C. columbiana Howell may or may not be a distinct species; we have not yet seen adequate material from the Columbia basin. However such material from our area as was identified C. columbiana did not appear to be essentially different from C. rotundifolia.

2. C. succulenta Link (var. occidentalis (Britton) Palmer) -- Quite similar but the teeth not so sharp, those of the larger series much lower. Stones with well marked depressions on the two lateral faces. Mid-spring. Oak bluffs. -- (NS-NB)-Q-sMan, US.

We do not know the basis for the report of this species for southeastern Saskatchewan by Löve 1959.

3. C. Douglasii Lindley -- Black Hawthorn -- Also quite similar, but the spines shorter and the fruit darker. Fruit dark purple or blackish, with a well marked neck below the ring of sepals. Leaf teeth with a brown gland at tip. Late spring. Boisé Coteau and Rockies. -- (Aka), wO, swS-BC, US.

Disjunct east of the Rockies and occurring in the general area of the Boisé Coteau and also west of lake Superior. Reports from southern Manitoba and eastern Ontario proved to be based on other species.

C. punctata Jacq. has been reported for Manitoba by Scoggan 1957 and for southern Saskatchewan by Löve 1959. The only Manitoba sheet (CAN) is dated Aug. 14, 1872, yet the specimen is only in flower, obviously the label data of this specimen is questionable. Further, the specimen itself is C. succulenta. We are not aware of the basis for the Saskatchewan report.

Tribe 3. RUBEAE

Carpels numerous, free and fleshy. Shrubs with short-lived stems.

9. RUBUS L.

Fruit raspberry-like, edible, thimble-shaped, made up of numerous small, fleshy, adhering carpels. Shrub usually sterile the first year (=primocane), becoming woody and flowering the second year (=floricane).

a. Leaf simple.

b. Low, 1-3 dm high 1. R. Chamaemorus

bb. Much taller 5. R. parviflorus

aa. Leaf compound.

c. Low, 1-3 dm high.

d. Leaves with 5 leaflets 4. R. pedatus

dd. Leaves trifoliate.

- e. No primocane; stem erect and flowering the first year 2. R. arcticus
 ee. Sterile trailing primocanes present, flowering the second year 3. R. pubescens
 cc. Much taller 6. R. idaeus

1. R. Chamaemorus L. -- Bake-Apple, Yellowberry (Chicouté, Plaquebière) -- A low bog plant with large, reniform and palmately lobed leaves. Dioecious, with the stems more or less buried in Sphagnum. Erect herbaceous shoots with 2 or 3 leaves and a single white terminal flower. Floral parts in 4's, or 5's, or 6's. Fruit at first reddish, maturing nearly white. First half of summer. Picea mariana bogs. -- G-Aka, L-SPM, NS-BC, US, Eur.

2. R. arcticus L. var. acaulis (Mx.) Boivin (R. acaulis Mx.) -- Dewberry, Ground-Raspberry (Mares rouges) -- Another bog plant, this one quite herbaceous except for the buried woody base. Stem erect, up to 1.5 dm high, with a few trifoliate leaves and a single terminal flower, pink to dark rose. Leaflets obtuse or rounded at tip. Floral parts in 6's or 7's. Sepals 6.5-10.0 mm long. Petals 10-15 mm long. Late spring and early summer. Fruit edible, red. Bogs. -- K-Aka, L-SPM, Q-BC, US.

In var. stellatus (Sm.) Boivin occurring from Northern B.C. to Alaska, some of the leaves are simple, being trilobed to tripartite, and the flowers are larger.

3. R. pubescens Raf. var. pubescens (R. triflorus Rich.) -- Dewberry, Flurboy (Catherinettes, Fraises à pied) -- Primocane long and trailing, dying back almost entirely in winter. Floricane bearing near the base a few erect flowering branches. Leaves trifoliate, the leaflets usually subacuminate. Calyx lobes 3.0-5.0-(6.5) mm long. Petals white, 4-7 mm long. Fruit bright red. Late spring and early summer. Moist rich woods. -- (K-Y), L-SPM, NS-BC, US -- F. roseiflorus (Peck) House -- Flowers pink -- Q-Q, S-Alta -- Var. paracaulis (Bailey) Boivin (R. arcticus AA.; R. paracaulis Bailey) -- Intermediate to R. arcticus and perhaps an inter-specific hybrid. Calyx lobes (4)-5-9-(10) mm. Petals pink, (5)-8-12-(14) mm long. Fruit dark red. Boggy woods. -- (Mack), L-NF, NS, Q-Alta.

4. R. pedatus Sm. -- Trailing stems with pedately 5-foliate leaves. Flower white, solitary. Fruit reddish and small, with only 1-6 fleshy carpels. First half of summer. Woods: western Alberta. -- (Y) Aka, Alta-BC, US.

5. R. parviflorus Nutt. -- Thimbleberry -- A large semi-shrub with Maple-like leaves and large white flowers that dry yellow. Up to 2 m high. Leaves large, palmately lobed and serrate. Flowers 3-5 cm across, in small showy corymbs. Fruit a finely pubescent, hemispheric, red raspberry. Early to mid summer. Forest openings: Cypress Hills and western Alberta. -- Aka, wO, Alta-BC, US, CA.

6. R. idaeus L. var. aculeatissimus Regel & Tiling (var. canadensis Rich., var. strigosus (Mx.) Max.; R. melanolasius Focke; R. strigosus Mx.) -- Raspberry (Framboisier, Rieck) -- Semishrub

with the stem abundantly armed with weak acicules. Usually about 1 m high. Leaves of two kinds, those of the primocane mostly 5-foliate, those of the floricanes mostly trifoliate. Flowers white. The fruit is a red raspberry. First half of summer. Open and semi-open places in forested regions. --K-Aka, L-NF-(SPM), NS-BC, US, (CA, eEur) -- F. tonsus (Fern.) Boivin -- Unarmed or nearly so. Local. -- (NF), O, S, (US) -- F. erythrochlamydeus Boivin -- Petals red. Also local: Elbourne -- Y, S.

American plants are glandular-stipitate in the inflorescence while the eurasian var. idaeus is eglandular and its armature tends to be of short and small prickles, especially in the inflorescence. The latter is cultivated for its fruits and has been reported as a casual escape in eastern Canada.

Young leaves are finely white-tomentose below. Typically this tomentum erodes gradually during the summer until in the later part of the season the older leaves will have turned green and nearly glabrous below. In a minority of specimens (var. peramoenus (Greene) Fern. or R. viburnifolius (Greene) Rydb.) the young leaves will quickly become green below and eventually glabrous before they are fully grown. This variation is generally distributed but appears to be relatively more frequent west of Saskatchewan than eastward.

Many authors will distinguish a var. canadensis with stems glabrous between the acicules from a var. strigosus with stems more or less finely tomentose. Both types are common and equally widespread; their taxonomic value is not obvious except perhaps as very minor phenotypes.

Tribe 4. POTENTILLEAE

Carpels numerous, free and dry (=achenes). Nearly all herbs, most of them with a double calyx.

10. FRAGARIA L.

STRAWBERRY

Fruit a strawberry, that is a fleshy fruit in which the fleshy part is the enlarged receptacle. The numerous dry and small achenes are scattered on top of the fleshy receptacle. Small herbs, stemless, with rosettes of trifoliate leaves and long superficial stolons that root at the nodes. Flowers in a corymb, borne on a scape.

- a. Fruit with an even surface 1. F. vesca
 aa. Fruit surface deeply pitted 2. F. virginiana

1. F. vesca L. var. americana Porter -- Squaw-Berry, Sow-Teat-Strawberry (Fraisier à Vaches, Fraisier des bois) -- Fruit glabrous or nearly so. Surface of the receptacle nearly even and the achenes standing above the surface. Apical tooth of the leaflet about as large as its neighbours and slightly overtopping them. Calyx-lobes commonly reflexed at maturity. Strawberry usually conical. Late spring to mid-summer. Fresh soils, open or wooded. -- Mack, (NF), NS, NB-BC, US -- Var. crinita (Rydb.) C. L. Hitchc. (var. bracteata (Heller) Davis) -- Fruit as above, but the calyx rather like the next species, that is somewhat appres-

sed and enveloping the base of the fruit. -- wAlta-BC, wUS.

2. *F. virginiana* Duch. (var. *terrae-novae* (Rydb.) Fern. & Wieg.; *F. canadensis* Mx.; *F. glauca* (Watson) Rydb.; *F. pauciflora* Rydb.) -- Wild Strawberry (Fraisier des champs) -- Quite similar to the preceeding and only doubtfully distinguishable when in flower. Apical tooth of the leaflet only half as large as its neighbours. Surface of the ripe receptacle slightly hairy, deeply pitted, with each achene attached at the bottom of a pit and half or more buried into the flesh. Calyx-lobes normally more or less appressed around the base of the fruit. Strawberry commonly globose and much sweeter than in the preceeding. First half of summer. Dry woods. -- K-Mack-(Y)-Aka, L-(NF-SPM), NS-(PEI)-NB-S-(Alta)-BC, US.

POTENTILLA L.

CINQUEFOIL

The basic type of the Potentillaeae with a double calyx and numerous, dry, free achenes. Leaves compound, petals usually yellow and flowers 5-merous.

- a. Shrub with entire leaves 1. *P. fruticosa*
- aa. Herbaceous or rarely with a shrubby base.
 - b. Stemless, flowers solitary on long
scapes 25. *P. Anserina*
 - bb. Stem present.
 - c. Calyx and corolla purple 5. *P. palustris*
 - cc. Calyx green or whitish-tomentose;
petals cream to yellow.
 - d. Leaves all or mostly pinnate.
 - e. Leaflets serrate to lobed Group 1
 - ee. Leaflets dissected more than
halfway to the midrib Group 2
 - dd. Leaves trifoliate to digitate or
subdigitate.
 - f. Leaves trifoliate Group 3
 - ff. Leaves with 5 or more leaflets,
or some of the upper ones tri-
foliate Group 4

Group 1

Leaves pinnate, the upper sometimes trifoliate. Leaflets serrate to lobed.

- a. Leaflets green on both faces.
 - b. Glandular; stem leaves 0-2.
 - c. Tall, 3-8 dm high; the inflorescence
compact 3. *P. arguta*
 - cc. Less than 4 dm high, the inflorescence
quite open.
 - d. Leaflets glandular, serrate... 4. *P. glandulosa*
 - dd. Non glandular and coarsely toothed
to narrowly lobed 14. *P. Drummondii*
 - bb. Non-glandular; with 4-7 stem leaves.... 11. *P. paradoxa*

- aa. Leaflets grayish to white-tomentose below.
 - e. Leaflets white-tomentose below 12. P. Hippiana
 - ee. Leaflets not tomentose, but grayish-pilose to hirsute below 6. P. pennsylvanica

Group 2

Leaves pinnate, the upper sometimes trifoliate. Leaflets pinnatifid to pinnatipartite.

- a. Leaflets equally green on both faces 10. P. plattensis
- aa. Pale green to white below.
 - b. Pale green to grayish-pilose or glandular below 6. P. pennsylvanica
 - bb. White-tomentose below.
 - c. Pectinatipartite and the margin revolute.
 - d. Upper stem leaves with stipules
+ ovate, coarsely toothed to semi-pectinate 7. P. bipinnatifida
 - dd. Stipules linear to lanceolate, entire 8. P. multifida
 - cc. Not quite so deeply and so narrowly dissected, the margin revolute or not.
 - e. Mid-summer flowering arctic and alpine species 18. P. nivea
 - ee. Spring flowering prairie species.
 - f. Early spring flowering; stems
1 dm long or less 16. P. concinna
 - ff. Late spring flowering; stems
1-2 dm long 9. P. saximontana

Group 3

Leaves all or mostly trifoliate.

- a. Leaflets cuneate, three-toothed at apex.
 - b. Inflorescence very lax with obvious white petals 2. P. tridentata
 - bb. Inflorescence congested; the yellow petals minute 24. P. Sibbaldii
- aa. Leaflets broader, not cuneate and more than three-toothed.
 - c. Leaflets densely and more or less whitish-tomentose below 18. P. nivea
 - cc. Green below.
 - d. Stem-leaf only one or none below the inflorescence 19. P. flabellifolia
 - dd. Stem quite leafy.
 - e. Petals broad, longer than the calyx tube 22. P. norvegica
 - ee. Petals narrow and inconspicuous, being shorter than the calyx tube 23. P. rivalis

Group 4

Leaves digitate, the upper ones sometimes trifoliate.

- a. Leaflets grayish to white-tomentose below.
 - b. Stems quite leafy; petals only 2-5 mm long 20. P. argentea
- bb. Stem leaves 0-3 below the inflorescence; flowers larger.
 - c. Stems 1 dm long or less; flowering in early spring 16. P. concinna
 - cc. Usually taller and summer-flowering.
 - d. Leaflets 3-5; plants 2.5 dm high or less.
 - e. Leaflets pinnatipartite, with narrow lobes 17. P. quinquefolia
 - ee. Not so deeply divided, serrate to coarsely lobed 18. P. nivea
 - dd. Usually taller, the leaflets 5-9 per leaf 13. P. gracilis
- aa. Leaflets less densely pubescent, green below.
 - f. Inflorescence a very leafy cyme; petals minute 23. P. rivalis
- ff. Open corymb leafy at base only; flowers large.
 - g. Stem leaves 1-3 below the inflorescence.
 - h. Leaflets coarsely toothed (or lobed) to the base 13. P. gracilis
 - hh. Leaflets coarsely toothed above, entire at least in the lower third 15. P. diversifolia
 - gg. Stem leaves 4 or more 21. P. recta

1. P. fruticosa L. (Dasiphora fruticosa (L.) Rydb.) -- Buck-Brush, Gold-Withy -- Shrub with pinnate leaflets. Very branchy, up to 1 m high. Bark soon shedding. Leaflets 5-7, lanceolate, entire, revolute, thickish. Flowers yellow. Flowering all summer. All kinds of open or semi-open places, mostly on black soils and at edge of woods. -- (K) Mack-Aka, L-SPM, NS, NB-BC, US, Eur.

2. P. tridentata Aiton (Sibbaldiopsis tridentata (Aiton) Rydb.) -- Tufted herb from a thin, woody rhizome, 1-2 dm high, with white flowers in a large open cyme. Leaves mostly basal, trifoliate. Leaflets cuneate, 3-toothed at tip. All summer. Sandy Pine woods and precambrian outcrops. -- G, K-sMack, L-SPM, NS-cAlta, US.

3. P. arguta Pursh var. arguta (Drymocallis agrimonioides (Pursh) Rydb.; D. arguta (Pursh) Rydb.) -- Stem stiff, 3-8 dm high, abundantly covered, along with the petioles and inflorescence, with long glandular and viscid hairs. Leaves pinnate, the leaflets green, coarsely serrate. Inflorescence compact, of more or less cream-coloured flowers. First half of summer. Occasional in open places on better soils. - Mack-Y, NB-BC, US --

Var. Convallaria (Rydb.) Th. Wolf -- Leaflets not only glandular, but also velvety pubescent on both faces, Rockies. -- Y-Aka, Alta-BC, US.

4. P. glandulosa Lindley var. intermedia (Rydb.) C.L. Hitchc. (ssp. pseudorupestris (Rydb.) Keck) -- Similar to the preceeding and sometimes grading into var. Convallaria, but smaller, less leafy and the inflorescence open. Stems 1.0-2.5 dm high, with few or even no stem-leaves below the inflorescence. Pubescence glandular, usually also partly villous and non-glandular. Petals slightly longer than calyx lobes. First half of summer. Alpine slopes. Waterton. -- Alta-seBC, nwUS.

The more western var. glandulosa has smaller flowers, the petals no longer than the calyx lobes, and the pubescence usually uniformly glandular.

5. P. palustris (L.) Scop. (Comarum palustre L.) -- (Comarret) -- The petals purple and persistent; the calyx also purple, at least inside. Leaves pinnate with 5-(?) approximate leaflets. Leaflets glabrous to silky, \pm lanceolate, 3-7 cm long, serrate, paler beneath. Early summer. Marshes and bogs. -- (G), K-Aka, L-SPM, NS-BC, US, Eur -- Var. parvifolia (Raf.) Fern. & Long -- Leaflets smaller and broader, 1-3 cm long, ovate or obovate to narrowly oblong. Arctic and subarctic marshes. -- G, K-Aka, L-(NF, NS), Q-Man, BC, US.

6. P. pensylvanica L. var. pensylvanica (var. glabrata (Hooker) Watson, var. pectinata Lep.; P. glabrella Rydb.; P. pectinata Raf., [nom. ill.]; P. platyloba Rydb.) -- Leaves pinnate, pale green to grayish pilose below. Tufted perennial, the stems 2-6 dm high, decumbent at base or erect. Stems and petioles light tomentose to strigose or short pilose. Leaflets oblanceolate, lobed to pectinatifid, glabrous or glandular to silky above, paler and usually glandular and grayish silky below. Early to mid summer. Hillsides, prairies and steppes. -- Mack-Aka, Q-BC, US, Eur -- Var. atrovirens (Rydb.) Th. Wolf (var. arida Boivin, var. strigosa AA.; P. strigosa AA.) -- Petioles hirsute, the pubescence \pm spreading and the hairs up to 1-3 mm long. Steppes. -- (Y-Aka), Q-BC, US, CA, Eur -- Var. litoralis (Rydb.) Boivin (var. pectinata AA.; P. pectinata AA.) -- Leaflets approximate and rather few, usually 5-7, often giving the leaf a rather pentagonal outline. -- K-(Mack, L)-NF, NS, Q-Man-(nwS)-Alta, (US).

A rather variable and much divided type, gradually more variable westward. Many variations appear to be almost but not quite sympatric, hence of limited, if any, interest. At one time or another we have tried to recognize quite a few variants but we admit to much intellectual dissatisfaction with most of them. We are herewith recognizing only 3 types: the main var. pensylvanica, common in all sorts of grassy and open habitats, mainly on prairies; a var. atrovirens more coarsely and more stiffly pubescent, the common type on drier prairies and steppes, becoming quite local, yet widespread, outside the main area of steppe; a var. litoralis which occurs primarily along the east coast, but also inland especially around the larger bodies of water, and

sporadically westward across the northern part of the range as far west as Alberta.

P. pectinata Raf. is illegitimate because it included when published the earlier *P. pensylvanica*. The two are therefore nomenclaturally synonymous and it is quite incorrect to apply them to different taxa. Var. *litoralis* is the earliest name available for what has been incorrectly called var. *pectinata*.

7. *P. bipinnatifida* Douglas (*P. pensylvanica* L. var. *bipinnatifida* (Douglas) T. & G.) -- Leaflets narrowly pectinatifid, white-tomentose below. Stem tomentose, 2-5 dm high. Leaves pinnate, the basal ones with 5-7 leaflets, the cauline with 3-5 leaflets, green and silky above. Lobes slightly revolute at margin. Middle and upper leaves with \pm ovate stipules, coarsely toothed to semi-pectinate, white-tomentose dorsally. Calyx densely silky-tomentose dorsally. Bractlets about as long as the calyx lobes. First half of summer. Dry prairies and open Pine woods. -- Mack, wO-seBC, US.

Native in our area; introduced west of us at McBride, B.C. Perhaps also introduced at Schreiber east of us. Reports from still further east are probably incorrect.

8. *P. multifida* L. -- Similar. Stem strigose, 1-4 dm high. Basal leaves with 7 leaflets, the stem leaves with 5-7. Stipules of the stem leaves entire, linear to lanceolate, not white below except in the inflorescence. Leaflets finely pectinate, strongly revolute. Calyx silky dorsally. Bractlets smaller, much shorter than the calyx lobes. First half of summer. Open rocky places and bare gravels. -- K-Aka, Q-neBC, Eur.

9. *P. saximontana* Rydb. (*P. Macounii* Rydb.; *P. rubripes* Rydb.) -- Tufted perennial, decumbent to loosely ascending, the stems 1-2 dm long. Basal leaves pinnate, about 1 dm long. Leaflets green above, whitish-tomentose below, the lobes oblong-lanceolate. Flowers few. Late spring. Hillsides along the southern border. -- swMan-seAlta, US.

Known from Dalry, Carievale, Pickthall and the Cypress Hills.

10. *P. plattensis* Nutt. -- Very finely divided and equally green on both faces. Stems spreading, 1-2 dm long, diffusely branched. Basal leaves almost as long as the stems, pinnate, with numerous leaflets, the main ones with 5-9 lobes. Late spring and early summer. Alkaline soils. -- swMan-Alta, US.

More compact alpine forms have been called *P. ovina* J.M. Macoun.

11. *P. paradoxa* Nutt. (*P. Nicolleii* (Watson) Sheldon) -- Leaflets of the upper pair long decurrent on the proximal side. Biennial or short-lived perennial. Leaves pinnate with 5-11 leaflets, pubescent but not glandular, green on both faces, crenate-serrate at margin. Flowers in a diffuse, cyme, numerous, small, the petals about 3 mm long, about equalling the calyx lobes. Mostly early summer. Shores of lakes and large rivers. -- O-seBC, US, (CA).

12. *P. Hippiana* Lehm. var. *Hippiana* -- White-tomentose throughout except on the upper surface of the leaflets which are green and silky to grayish. Leaves pinnate, the leaflets deeply

crenate-serrate. Calyx lobes silky dorsally, ending in a white hair tuft. Bractlets similar to the calyx lobes. Late spring to mid summer. Prairies and steppes. -- (NS), Q-BC, US -- Var. argyrea (Rydb.) Boivin (P. argyrea Rydb.) -- Leaflets nearly equally whitish-tomentose on both faces. Calyx as in var. Hippiana. Dry hills. -- sS-Alta, US -- Var. filicaulis (Nutt.) Boivin (P. effusa Douglas) -- Leaves white on both faces. Calyx lobes ending in a brownish, glabrous mucro. Bractlets much smaller, green and lightly tomentose, also ending in a brownish, glabrous mucro. Dry and eroded hills. -- sMan-sAlta, US.

Our three varieties are recognized primarily because they seem to have individualized ranges in our area. But we are not at all sure that they do represent biological units; they could be mere extremes of variation. From the specimens at hand, var. filicaulis seems to be the more common and more widespread variety south of us.

13. P. gracilis Douglas var. gracilis (var. filipes (Rydb.) Boivin, var. glabrata (Lehm.) C.L. Hitchc., var. Nuttallii (Lehm.) Sheldon, var. permollis (Rydb.) C.L. Hitchc., var. pulcherrima (Lehm.) Fern., var. rigida Watson; P. camporum Rydb.; P. Hippiana Lehm. var. pulcherrima (Lehm.) Watson; P. juncunda Nelson; P. Nuttallii Lehm.; P. pulcherrima Lehm.; P. rigida Nutt., [nom. ill.]; P. viridescens Rydb.) -- Cinquefoil -- Tufted perennial 2-7 dm high. Basal leaves with 5-9 leaflets, all digitate or some of them subdigitate. Stem leaves mostly 2-3. Leaflets ± oblanceolate, serrate to pinnatifid, green and silky to white-tomentose below. Petals slightly longer than the calyx. Early to mid summer. A common prairie plant. -- Y-Aka, PEI, Q-BC, US -- Var. flabelliformis (Lehm.) Nutt. (var. ctenophora (Rydb.) Boivin; P. flabelliformis Lehm.) -- Leaflets more deeply divided, pectinatifid to pectinate. Moist prairies. -- Aka, (Q), Man-BC, US.

Native east to the Great Lakes, probably introduced further east. Intermediate between the digitate and the pinnate series; subdigitate specimens are liable to be mistaken for P. Hippiana.

Fully as variable as the last species. Our earlier and more elaborate classificatory attempts proved unsatisfactory as one varietal range after another gradually filled out to the size of the collective range. However var. flabelliformis and the sympatric var. ctenophora still retain a somewhat restricted range and are therefore still maintained, but as a single taxon.

Var. pulcherrima is often used to designate the mostly larger plants with mostly subdigitate leaves and the leaflets mostly whiter below. It is sporadic throughout the range and does not seem to be well enough defined to warrant taxonomic recognition.

14. P. Drummondii Lehm. -- Leaves dimorphic, the stem leaves digitate, with 3-5 leaflets, the basal ones short pinnate, with 5-9 leaflets. Otherwise much like the next but tending to be taller and slightly more pubescent. Leaflets ciliate and glabrous or pilose dorsally. Stem and calyx ± pilose. Summer. Low alpine or subalpine meadows. -- Aka, swAlta-BC, nwUS.

15. P. diversifolia Lehm. var. diversifolia (var. glaucophylla (Lehm.) Watson; P. glaucophylla Lehm.) -- Perennial 2-4

dm high, tufted, with little pubescence. Leaves digitate, few, rather large. Leaflets broadly oblanceolate, entire and cuneate at base, coarsely serrate above the middle, glabrous on both faces or slightly hirsute along the nerves below, paler beneath and often slightly glaucous. Early summer. Montane prairies. -- (Mack)-Y-Aka, sWS-BC, US -- Var. perdissecta (Rydb.) C.L. Hitchc. (var. multisecta AA.) -- Intermediate to P. gracilis, the leaflets being deeply divided most of their length. Plants small, 1-2 dm high, and little pubescent as in var. diversifolia. -- sW Alta-(seBC, US).

Two Manitoba collections were listed by Bell 1881 as P. diversifolia and also later by Macoun 1883 as P. dissecta. More recently Scoggan 1957 has referred them to P. norvegica. We have examined the York Factory collection (QK; DAO, photo) and revised it to P. multifida.

16. P. concinna Rich. var. concinna (P. humifusa Nutt.) -- A small tufted perennial, quite conspicuous in early spring on dry eroded hillsides. Stems spreading, 1 dm long or less, barely overtopping the leaves. Basal leaves digitate, with 5 leaflets. Stem leaves much reduced. Leaflets obovate to cuneate, 1-3 cm long, coarsely serrate to pinnatifid, the lobes triangular to oblong, white-tomentose below. Early spring on rolling steppes. -- Man-Alta, US -- Var. dissecta (Watson) Boivin (var. divisa Rydb.) -- Leaves digitate or subdigitate, the leaflets more divided, pinnatifid to pinnatipartite. Lobes \pm lanceolate. -- sWS-seAlta, (US).

In conformity with Rydberg's treatment of 1908 in the North American Flora, we presume that Watson's type material of var. dissecta is made up of two elements, one of which comes from Montana and belongs to var. dissecta as interpreted herewith. The other element comes from the headwaters of the Smoky River and belongs to the P. nivea group.

At the varietal rank, var. dissecta has priority over var. divisa.

17. P. quinquefolia Rydb. (P. Hookeriana AA.; P. nivea L. var. Hookeriana AA., var. pentaphylla Lehm.) -- A small tufted perennial, 1-3 dm high, with digitate leaves, all with 5 pectinate leaflets or some of them with only 3 leaflets, green above, white tomentose below. Early summer. Dry hills and sandy Pine woods. -- Y, Man-BC, US.

Not always clearly distinct from the following.

18. P. nivea L. var. nivea (var. incisa Turcz., var. lappo-nica C. & S., var. macrophylla Ser., ssp. Chamissonis (Muhlén) Hiit., ssp. Hookeriana (Lehm.) Hiit.; P. Ledebouriana Pors.; P. uniflora Led.; P. Vahlia Lehm.) -- A low, densely tufted perennial, often forming cushions. Stems short, usually about 1 dm high, few flowered to single-flowered. Leaflets 3, rarely 5, green above, white-tomentose below, the pubescence otherwise quite variable in kind and density. Leaflet margin serrate to incised. Flowers relatively large and showy. Mid summer. Alpine and arctic or subarctic prairies. -- G-Aka, (L-NF), Q, nMan-nWS-sWAlta-BC, US, Eur -- Var. villosa (Pallas) Regel & Tiling (P. villosa

Pallas, var. parviflora C.L. Hitchc.) -- A coarse and densely villous extreme of the preceding. Leaflets thick, veiny and densely villous above, coarsely serrate, the tomentum often yellow-tinted below. Bractlets most often ovate, varying to lanceolate. Rocky outcrops in the mountains: Mt. Signal. -- Y-Aka, Alta-BC, (US, Eur) -- Var. pulchella (Br.) Durand (P. pulchella Br.; P. rubricaulis Lehm.) -- Coarser, the leaves trifoliate or mostly short pinnate with 5 large leaflets which are coarsely and deeply few-lobed. Basal leaves with rather large brown stipules, often up to 2-5 cm long. Dry arctic gravels and sands. -- G-Mack-(Y-Aka), L-TN, nQ-nMan, (Eur).

Often subdivided into a series of some 12 microspecies or varieties. The morphological discontinuity is weak or non-existent in all cases and the geographical segregation does not always conform to published distributions or maps. At least the above 3 varieties appear to be sufficiently distinct to warrant taxonomic recognition.

19. P. flabellifolia Hooker var. flabellifolia -- Perennial, very loosely tufted, about 2 dm high, green throughout and nearly glabrous or slightly puberulent. Leaves ternate, with usually only 1 stem leaf. Leaflets obovate, incised, glabrous to ciliate to lightly villous along the nerves. Petals around 1 cm long. All summer. Moist alpine meadows. -- (Alta)-BC, wUS -- Var. emarginata (Pursh) Boivin (P. emarginata Pursh; P. hyparctica Malte var. elator (Abrom.) Fern.) -- More densely villous, the hairs forming white tufts at the end of the teeth. Usually smaller, about 1 dm high and more densely tufted. Often suggesting a green phase of P. nivea. -- G-K-(Mack-Y)-Aka, L, Q, swAlta-BC, (Eur).

20. P. ARGENTEA L. -- Perennial and often depressed, quite leafy and white-woolly throughout, except the upper face of the leaflets. Leaves digitate, \pm incised. Flowers numerous and small in a diffuse cyme. Petals 2-5 cm long, not exceeding the calyx. All summer. Roadsides, footpaths and other tramped places. -- NF-SPM, NS-S, BC, US, Eur.

21. P. RECTA L. var. SULPHUREA (Lam. & DC.) Peyr. -- An erect perennial, the leaves green, numerous, digitate, with 7 narrowly oblanceolate leaflets. Hirsute, the stem rather leafy. Flowers numerous. Petals exerted. Early summer. Ditches, railway embankments, etc. -- NF, NS-S, BC, US, (Eur) -- Var. OBSCURA (Nestler) Koch -- Leaflets only 5. Petals often paler: Caron, Edmonton. -- NS, Q-O, S-Alta, (Eur).

22. P. norvegica L. (P. monspeliensis L., var. norvegica (L.) Farw.) -- Mostly biennial. Green, trifoliate and long hirsute. Stem erect, quite leafy, covered with numerous long and stiff hairs, almost like acicules at times. Leaflets obovate, slightly paler below. Inflorescence very leafy. Petals slightly shorter than calyx. Early summer. Open places, especially wet ones, often weedy. -- (G, K)-Mack-Aka, L-SPM, NS-BC, US, (CA), Eur.

A rare extreme of variation, var. labradorica (Lehm.) Fern., with the stem glabrous or nearly so, is sporadic in North America.

It may possibly be somewhat more frequent in Ungava and Labrador.

23. P. rivalis Nutt. (var. millegrana (Eng.) Watson, var. pentandra (Eng.) Watson; P. biennis Greene; P. millegrana Eng.; P. pentandra Eng.) -- Annual or biennial, green and finely soft pubescent. Stem often decumbent, leaves trifoliate, the lower ones often 5-foliate. Leaflets obovate to oblanceolate, coarsely serrate. Cyme very leafy and very diffuse. Petals yellow, very small, about 1 mm long, wilting white. First half of summer. Wet places, especially shorelines, less often weedy. -- W-O-BC, US.

Stamens vary in number, usually in multiples of 5, even on the same plant, and P. pentandra with only 5 stamens is a purely arbitrary segregate. The number of leaflets is also variable, especially with the lower leaves and plants with all leaves trifoliate have been called P. millegrana.

24. P. Sibbaldii Haller f. (Sibbaldia procumbens L.) -- Leaves green, the 3 leaflets cuneate and 3-toothed at apex. Stoloniferous and matforming, the stems mostly less than 1 dm high. Petals very small, included. Early summer. High alpine prairies in the Rockies. -- G-Aka, L-NF, Q, Alta-BC, US, Eur.

We fail to detect any character of generic value between Potentilla and Sibbaldia. The latter, like the average Potentilla, has a caliculate calyx, yellow petals, stamens in variable number, usually 5 or a multiple of 5, and carpels similarly varying in number, mostly in multiples of 5. Key characters commonly used to separate Sibbaldia have been found to be quite unrealistic.

25. P. Anserina L. var. Anserina (Argentina Anserina (L.) Rydb.) -- Silverweed (Argentina, Richette) -- Stemless and spreading by long superficial stolons rooting at the nodes. Leaves tufted, lyrate-pinnate, up to 3 dm long. Leaflets of two sizes, the larger ± alternating with the smaller, green above, white tomentose below. Flower solitary on a long scape. Bractlets ± ovate and tomentose dorsally, often coarsely toothed. Late spring to mid summer. Open moist places. -- G, K-Aka, L-SPM, NS-BC, US, Eur. -- F. sericea (Hayne) Hayek (P. pratensis Boivin; Argentina argentea Rydb.) -- Leaflets grayish or whitish tomentose above. -- (G), Mack-Y, (NF, NS), Q-(C)-Man-BC, US, Eur. -- Var. yukonensis (Hultén) Boivin (P. yukonensis Hultén) -- Calyx with the bractlets usually entire, lanceolate, nearly glabrous and often slightly longer than the calyx lobes. Leaflets often broader, ± obovate, and more deeply incised. Shores of rivers and large lakes. -- Mack-Aka, Man-Alta, US -- Var. groenlandica Tratt. (P. Egedii Wornsk. var. groenlandica (Tratt.) Pol.) -- Much smaller and essentially glabrous except for the lower faces of the leaflets. Leaves usually shorter, mostly less than 1 dm long. Leaflets 1-2 cm long, the smaller ones very small and few or even lacking. Arctic and subarctic shores. -- G-Mack, L-NF, Q-(O)-nMan.

All these forms and varieties are linked by more or less numerous intermediates.

12. CHAMAERHODOS Bunge

As in Potentilla, but the calyx simple, being devoid of bractlets. Stamens only 5.

1. G. erecta (L.) Bunge var. parviflora (Nutt.) C.L. Hitchc. (G. Nuttallii (T. & G.) Pickering) -- Biennial, glandular and more or less pubescent. Stem solitary, usually simple, 1-4 dm high. Basal leaves tritermatifid, the lobes linear-oblong, 1 mm wide or less. Stem leaves gradually smaller and less divided. Petals white, about 2.5 mm long. Mid-spring to mid-summer. Arid hill-sides and rocky or sandy places. -swY, Man-BC, US.

Barely distinguishable from the siberian var. erecta. The latter often has longer peduncles and the sepals are mostly somewhat narrower.

13. GEUM L.

AVENS

Like Potentilla, but the styles longer, persistent and elongating in fruit, becoming either plumose or hooked and catchy.

a. Stem leaves 2, opposite 4. G. triflorum
aa. Leaves alternate.

b. Calyx lobes erect, generally purple tinted, petals yellow to purple, persistent 3. G. rivale

bb. Lobes green, reflexed at anthesis, petals yellow, deciduous.

c. Upper stem-leaves not quite trifoliate, merely tripartite; lower internode of the mature style 3.0-4.5 mm long, finely glandular 2. G. perincisum

cc. Upper stem-leaves trifoliate; lower internode 5.0-6.0 mm long, not glandular 1. G. aleppicum

1. G. aleppicum Jacq. (G. macrophyllum Ait.; G. strictum Aiton) -- Herb-Bennet -- A perennial herb, solitary or in small tufts. Stem 5-7 dm high, stiffly hispid. Leaves lyrate, alternate. Petals ovate, sessile, yellow. Fruits forming a subglobose head 18-22 mm long, 17-20 mm wide. Style with a double bend, the lower internode persistent and maturing into a catchy hook. Lower internode not glandular, merely hirsute towards the base. First half of summer. Wet prairies and open Poplar bluffs. -- Mack, Aka, NS-BC, US, (CA), Eur.

The american plants are often segregated as a New World variety or species under a name, G. strictum, which is an illegitimate name and nonconclusively identical with the eurasian G. aleppicum. A substitute name was prepared in 1919 and used extensively on herbarium sheets but was never actually published because the reputed distinguishing characters proved to be too elusive.

All herbaria studied contained a variety of G. aleppicum and G. perincisum sheets masquerading as G. macrophyllum W. This is not due to the lack of distinctiveness between the three species. But most current floras emphasize a rather weak and inconstant basal leaf difference, hence the current confusion.

Most obviously, in G. macrophyllum the upper stem leaves are trilobed (typical) or trifid (var. Rydbergii Farw.) and the lobes are squarish (typ.) to broadly oblanceolate (var. R.). In our

two prairie species the leaves are always trifoliate (alep.) or divided almost to the base (perin.) and the lobes much narrower. Taking into account this character and also leaf-shape, pubescence of the inflorescence, calyx and achenes, etc., G. macrophyllum has been revised out of our area.

11. G. aurantiacum Fries (G. pulchrum Arn.) -- Hybrid of G. rivale. Quite similar to G. periale and not readily distinguishable from it. Leaflets somewhat broader and with more rounded teeth, as in G. aleppicum. Local: Elbow River. -- Alta-(BC).

The Fernald 1950 report of G. pulchrum Fern. for Alberta is apparently based on Lacour 24017, Elbow River, 1907 (Hb.; DAO, photo), which is also the only known sheet of G. aurantiacum for our area. G. pulchrum is the hybrid G. macrophyllum x G. rivale; one of its parents is absent from our area.

12. G. perincisum Rydb. var. perincisum (G. macrophyllum L. var. perincisum (Rydb.) Eng.) -- Generally similar to the preceding and usually confused with it, but the achenes smaller and in a smaller head. Upper stem leaves not quite trifoliate, merely tripartite. Fruiting head obovoid, 15-20 mm long, 13-14 mm wide. Lower internode of the style 3.0-(3.5) mm long, finely glandular, not hirsute. Late spring and early summer. Wet prairies and open bush. -- K-Aka, Q-BC, US -- Var. intermedium Boivin -- Fruiting head slightly bigger, 15-17 mm wide, the lower internode about 4 mm long. Lower stem leaves usually less divided, with only 3-7 leaflets. Boisé Coteau. -- soS.

Var. intermedium var. n. Folia caulinarum stipulis 6-18 mm, summis grosse dentatis vel superioribus saepius integris. Folia caulinarum inferiora rachide 1-3 cm. Achenium stylo cujus internodium inferius (3.5)-4.0-(4.5) mm et superius 1.3-1.8 mm. Caput fractum subglobosum, 16-18 mm long., 15-17 mm lat. Type: A.J. Breitung 4249, Cypress Hills Park, wet meadows, occasional, July 2, 1947 (DAO).

2X. G. periale Boivin -- Hybrid of G. rivale x perincisum var. intermedium. Upper stem leaves trifoliate. Calyx lobes reflexed, lightly purple-tinged dorsally. Petals golden yellow, purple-tinged, deciduous. Lower internode of the style glabrous. Wet meadows in the Cypress Hills. -- soS.

Hybr. n. Planta hybrida et intermedia inter parentes: G. rivale et G. perincisum var. intermedium. Folium caulinarum superius trifoliatum foliis late obovatis-latis. Lobi calycis reflexi, 4-6 mm long., dorsales paullum purpureo tincti. Petala aureo-lutea, paullulum rubro tincta, obcordata, subsessilia, decidua. Internodium superius styli deciduum, plumosum, 2.5-3.0 mm; internodium inferius persistens, glabrum. Grana pollinis W.M. Bowden observavit et invenita fuerunt tawacenta. Type: A.J. Breitung 3491, Cypress Hills Park, low meadow, July 2, 1947 (DAO).

3. G. rivale L. -- Chamaelirium (Herb. a la tache) -- Large nodding flower, showy mainly because of the persistent dark-red calyx. Erect perennial 5-6 dm high. Leaves lyrate, the upper smaller to simple. Calyx lobes erect at anthesis, often becoming reflexed in fruit. Petals marcescent, pale yellow with purple markings, unguiculate, filiciform, included. Lower style inter-

node glabrous. First half of summer. Wet places. --seK, L-SPM, NS-BC, US, Eur.

4. G. triflorum Pursh var. triflorum (Sieversia triflora (Pursh) Br.) -- Three Sisters, Old Man's Whiskers -- One of the common and showy spring flowers: 3 purple flowers nodding on long peduncles. Leaves pinnate, mostly basal. Stem leaves 2, opposite. Calyx purple, persistent. Petals 10-14 mm long, yellow and purple. Fruiting heads also very showy because of the persistent plumose styles elongating to 2.5-3.0 cm. Mid spring. Prairies. -- sMack, O-BC, US -- F. pallidum Fasset -- Flowers yellowish or greenish. Cypress Hills. -- soS, (US) -- Var. ciliatum (Pursh) Fassett -- Petals shorter, usually included or nearly so. Upper style internode usually deciduous. Waterton. -- (Alta)-BC, US.

We are not yet fully convinced of the value of var. ciliatum.

14. DRYAS L.

Petals more than 5, usually about 8-10, and the calyx lobes about as numerous. Low semishrubs with creeping woody stems forming carpets, large solitary terminal flowers and conspicuous fruiting heads because of the elongating plumose styles.

a. Leaves entire or nearly so 3. D. integrifolia
aa. Leaves crenate to tip.

b. Flowers yellow; leaves cuneate at

base 1. D. Drummondii

bb. Flowers white; leaves truncate to

cordate 2. D. octopetala

1. D. Drummondii Rich. -- Forming large loose carpets. Leaves elliptic, 1.5-3.0 cm long, coarsely crenate, cuneate at base, rounded at apex, green and glabrous or nearly so above, white-tomentose below. Calyx black-glandular, the lobes broadly triangular. First half of summer. Rocky slopes and gravel flats. -- Mack-Aka, sNF, (wO), nwS-BC, (nwUS) -- F. tomentosa (Farr) Hultén -- Leaves grayish-tomentose above. -- (Mack, Aka), seQ, swAlta-seBC.

2. D. octopetala L. var. Hookeriana (Juz.) Breitung -- (Chêneau, Chénette) -- Forming small dense mats. Leaves oblong-lanceolate, coarsely crenate, truncate to subcordate at base, strongly rugose above, white-tomentose below with brown glands on the nerves as on the petioles. Calyx white-tomentose and black-hairy, the lobes lanceolate. Petals white. Mid summer. High alpine on rock outcrops. -- Mack-Aka, Alta-BC, nwUS.

Leaves glandular and often black punctate on the upper face in our variety, while the more northern var. octopetala is glandular only on the lower face.

3. D. integrifolia Vahl (var. sylvatica Hultén) -- Leaves entire, triangular-lanceolate, truncate at base, smooth above, white-tomentose below. Calyx sparingly tomentose, the lobes narrowly lanceolate. Petals white. First half of summer. Forming a dense carpet in arctic or alpine prairies. -- G-Aka, L-NF,

NB-nMan, swAlta-eBC, (Eur).

At lower altitudes, such as gravel flats of braided glacial outlets, this plant becomes naturally taller, the leaves larger and less revolute (= var. sylvatica). Undoubtedly an ecological form.

Tribe 5. POTERIEAE

Fruit structure as in the Roseae, but the pistils much reduced in number (less than 5) and maturing into achenes. Herbs.

15. AGRIMONIA L.

AGRIMONY

The fruit catchy, beset with an equatorial ring of hooked bristles. Carpels 2, enclosed by the non-fleshy hypanthium which presents itself like an inferior ovary.

1. A. striata Mx. -- Perennial herb with pinnate leaves of large leaflets alternating with very small ones. Flowers small, yellow, in an elongated spiciform raceme, with 3-cleft bracts. Fruit reflexed and deeply furrowed below the ring of bristles. Before mid-summer. Aspen groves. -- NF, NS-BC, US.

Tribe 6. ROSEAE

Receptacle very much enlarged with a bottle-shaped cavity lined by the numerous dry carpels. Styles free and more or less protruding through the mouth of the cavity. This inferior-like ovary matures into a fleshy pome-like fruit called a hip. Shrubs, nearly always very spiny.

16. ROSA L.

ROSE

Flower a typical Rose, with 5 large, and mostly pink, free petals, borne on usually very spiny shrubs. The genus is characterized by its hips, as described above. There are two main types of spines; acicules are straight, thin and abruptly passing into a thin flat base; prickles are stronger and gradually thickened into a conical base.

- a. Stems and branches uniformly covered throughout with acicules of very unequal size 1. R. acicularis
- aa. Gradually less spiny above.
 - b. Stem simple, flowering the first year, dying back to near the ground every year 4. R. arkansana
 - bb. Sterile the first year, flowering on plants 2 year or older and ± branched.
 - c. Branches and upper half of the stem unarmed. Stipules not glandular-ciliate 2. R. blanda
 - cc. Acicules or prickles present on the branches.
 - d. Small, few-flowered, weakly

- acicular, less than 5 dm
 high 3. R. alcea
 dd. Taller, at least some pairs
 of prickles present.
 e. Mostly flowering the second
 year; prickles neither
 flattened nor recurved 5. R. Woodsii
 ee. Mostly flowering the third
 year; main axis with numerous
 strongly flattened prickles;
 branches mostly with recurved
 infrastipular prickles 6. R. terrens

1. R. acicularis Lindley var. Bourgeauiana Crépín -- (Eglantier) -- A forest species densely and uniformly covered with acicules on stem and branches. Mostly 1 m high. Acicules straight, the longest 5-10 times longer than the smallest ones. Stipules glandular-ciliate. Peduncles glabrous and unarmed. Early summer. Common throughout in nearly all kinds of forests. -- seK-Aka, Q-BC, US -- F. plena Lewis -- Double-flowered. Moose Range. -- (S).

The eurasian var. acicularis is reputed to differ from our plant by its glandular peduncles.

2. R. blanda Aiton var. blanda -- (Rosier sauvage, Eglantier) -- Unarmed or nearly so on the branches and upper part of the stem, but densely acicular below. Stipules not glandular-ciliate, but entire or serrate, each tooth with a large red gland at tip. Flowering from the second year. Early summer, the first to flower. Edge of woods, mostly near large rivers. -- Mack, NB-Man, US. -- F. alba (Schuette) Fern. -- Flowers white. Otterburne -- Man, (US).

Leaflets and stipules puberulent dorsally. In var. glabra Crépín the herbage is entirely glabrous or nearly so. The latter occurs mainly on the shores of the Great Lakes and of the larger eastern rivers, but it has also been collected at Wigley on the Mackenzie and may be expected to turn up eventually in the northern part of our area.

In 1965 we could not find at NY any specimen than could be tied to a report by Rydberg 1918, 1932 of R. subblanda Rydb. (= R. blanda var. glabra) from Manitoba. This was not the only case where a report by Rydberg could not be correlated with a justifying specimen at NY.

3. R. alcea Greene -- Prairie Rose -- A small weak species usually half hidden in the prairie vegetation. Stem rather thin, 1-5 dm high, branching little, with numerous weak acicules becoming less dense above. Stipules glandular-ciliate. Flowers few, often only one. Flowering for a few years, starting the second one. First half of summer. Prairies and steppes, very common. -- Man-Alta, (US).

4. R. arkansana Porter (var. suffulta (Greene) Cockerell; R. suffulta Greene) -- Prairie-Rose -- Stem short, 1-5 dm, simple and flowering the first summer, killed back by frost every winter.

Acicules abundant. Leaflets mostly 9. Flowers in a large terminal corymb, pink in bud, usually opening white. Last to flower: mid summer or a little earlier. Open places, mostly on sandy soil. -- Man-BC, US -- F. plena Lewis -- Flowers double. Woodrow. -- (S).

There is some doubt as to the precise application of R. arkansana and R. Woodsii. Hence some authors prefer to use R. suffulta and R. Fendleri respectively.

5. R. Woodsii Lindley (R. Fendleri Crépín; R. Macounii Greene) -- Prairie-Rose -- Well armed with both acicules and prickles, less densely so above. The branches often bearing only infrastipular prickles. Stipules not glandular-ciliate. Fruit smallest, 3-10 mm across. First year shoot simple and sterile, branching and flowering the second year, often continuing to flower for a few years. Early summer. Edge of woods and prairies, common. -- (Pack-Alta, O-Man)-S-Alta-(BC, US, CA) -- F. blanda (Turner) Boivin -- Ovary and fruit bristly. -- Alta, (US).

The typical form is glabrous and rare, but widespread. The more common phenotype is more or less pubescent and glandular, it is often distinguished as var. Fendleri (Crépín) Rydb. Taller individuals may reach 2 m and may be named var. ultramontana (Watson) Jenson. Neither phenotype appears to be taxonomically significant.

Reports from east of Saskatchewan remain to be confirmed. All Ontario and Manitoba specimens at DAU were revised to other species. The Val d'Or, Québec (CAN; DAU, photo) collection was an especially heavily acicular specimen of R. blanda.

6. R. terreus Lunell (R. Woodsii Lindley var. terreus (Lunell) Breitung) -- Much like the preceding but the first year shoot densely armed with acicules mixed with large flat prickles. Flowering very little the second year, but putting out long flagelliform branches armed with mostly recurved infrastipular prickles. Flowering abundantly in the early summer of the third year, the flowers mostly solitary and borne on short lateral branches. Usually dying after the third year. Mostly in the low bush along the water-courses in the dryer parts of the prairie. -- S, (US).

Macoun 1886 reports Rosa nutkana Presl from southwestern Alberta but this was never confirmed and the original specimen was not located. No Alberta collection could be found under that name at CAN, MTAG, etc., when we visited these herbaria. Presumably the original specimen has been revised to something else. There are a number of other similarly questionable reports in Macoun; most of them were ignored by later authors, but a few were repeated by others and some are still repeated in modern floras despite the apparent lack of herbarium justification.

Tribe 7. PRUNEAEE

Fruit a plum or a cherry, that is a fleshy fruit containing a single large seed.

17. PRUNUS L.

PLUM, CHERRY

Carpel solitary with a terminal style. Calyx with 5 lobes. Shrubs or trees with white flowers.

- a. Flowers in elongated racemes 1. P. virginiana
- aa. Flowers solitary or in fascicles.
 - b. Petiole densely pubescent ventrally 4. P. americana
 - bb. Petiole glabrous.
 - c. Leaves serrate from the middle, entire below 3. P. pumila
 - cc. Leaves serrate throughout 2. P. pensylvanica

1. P. virginiana L. (var. melanocarpa (Nelson) Sarg.; P. melanocarpa (Nelson) Rydb.) -- Choke-Cherry (Cérisier) -- Densely colonial shrub 1-5 m high with long racemes of white flowers followed by racemes of edible fruits. Leaves obovate, serrate, of two sizes, those of the flowering shoots only half as large as those of the leading shoots. Petals white, about 3 mm long, suborbicular. Fruit a globular cherry about 8 mm across, at first red purple, becoming nearly black at maturity, edible, sweet and delicious, but with a heavy after-choke. Late spring. Open woods, margin of bluffs, hillsides, etc., and quite common. -- swMack, NF-SPM, NS-BC, US -- F. xanthocarpa Sarg. -- Fruit whitish or yellowish at maturity. -- NB-(Q), S, (US).

Usually divided into an eastern var. virginiana, a western var. melanocarpa and a Pacific Coast var. demissa (Nutt.) Torrey based respectively on size of shrub, colour of fruit and pubescence of lower face of leaves. The colour of the cherry darkens as it matures and the pubescent phase var. demissa (or better f. Deamii G.N. Jones) is a rare variant sporadic in our range and elsewhere, while the height of the shrub is quite commonly 2-3 meters throughout the range. The occurrence of the odd small tree in some sheltered and undisturbed spot does not alter substantially the size picture of this shrub. Small trees are rare and we do not remember seeing any taller than 6 m in the east, although there are reports of up to 15 m for the eastern phase.

2. P. pensylvanica L. f. var. pensylvanica -- Pin Cherry (Merisier) -- Varying from a stoloniferous shrub to a small tree up to 7-8 m high. Foliage glabrous and somewhat sticky when young. Leaves ovate to lanceolate, glabrous, glandular-serrate. Flowers white, numerous and showy, appearing with the leaves, in fascicles of 2-5 at the end of short or long shoots. Fruit a small clear-red cherry, edible, rather acid, 5-7 mm across. All spring. Open and semi-open habitats. -- swMack, L-SPM, NS-BC, US, -- Var. saximontana Rehder -- Leaves more or less pubescent and/or the inflorescence ± racemose. -- Waterton and Pigeon Lake. WAlta-BC, US.

Var. saximontana is a highly variable type and gives the impression of being a series of generation segregates and backcrosses from a possible hybrid of var. pensylvanica with the Pacific Coast var. mollis (Douglas) Boivin. The modern distribution of the 3 entities shows only a slight overlap of ranges

with var. saximontana occurring mainly from the Rocky Mountain Trench to the east slopes of the Cascades, essentially filling the distribution gap between the other two taxa. The opportunity for hybridizing is nil for var. molle with var. pennsylvanica and only marginal for either with var. saximontana. There seems to be little doubt that the latter is now a population of its own and best treated as an intergrading variety rather than a conglomeration of hybrids.

3. P. pumila L. (P. Besseyi Bailey; P. nana Dufroi) -- Sand-Cherry (Racoumifer, Cerisier du sable) -- A low shrub, often simulating a Willow when sterile. Decumbent or creeping, more rarely erect when shaded, 5 dm high or less. Foliage glabrous. Leaves 3-7 cm long, narrowly obovate to oblanceolate, paler to subglaucous below, cuneate at base. Flowers white, appearing with the leaves, on last year's wood. Fruit a cherry up to 1.5 cm across, globular, dark purple, edible, often, but not always, sweet and tasty, sometimes choky. Late spring. Sandy soils. -- NB-ecS, US.

Proposed segregates of P. pumila appear to be mainly growth forms ecologically conditioned (P. nana) or stages of maturity (P. Besseyi).

4. P. americana Marsh. var. americana -- Plum, Wild Plum (Prunier, Prunier sauvage) -- Large spinescent shrub. Branches with numerous short shoots, leafy and floriferous, aging into spines. Leaves ovate or obovate, abruptly acuminate, serrate. Teeth not glandular but finely acuminate. Large white flowers appearing just before the leaves. Fruit 2-3 cm long, at first yellow, turning orange or red, edible, delicious. Mid spring. Open Oak woods and margin of galerieforests. --swQ-seS, US, (CA) -- Var. nigra (Aiton) Waugh (P. nigra Aiton) -- Leaves with rounded teeth ending in a large gland which becomes dark red later in the summer. -- NS, NB-sMan, US.

The subdivision of P. americana into two species is not a convincing classification in our part of the range where the fruit colour appears to be a stage of maturity rather than a taxonomic character. We have not had the opportunity to observe this character in the east in a good crop year.

The difference in leaf serration is real and sharp, but its geography is weak, the two types have a rather broad area of overlap. The leaf shape difference is so weak and indefinite as to be hardly worth mentioning.

16. LEGUMINOSAE (PULSE FAMILY)

Corolla papilionaceous, of free petals, the calyx united; stamens usually 10, one of which is free while the others are fused together by their filaments. Carpel solitary. Mostly herbs with compound leaves.

a. Plants climbing Group A
aa. Non-climbing.

b. Leaflets entire.

c. Leaves pinnate Group B

- cc. Leaves trifoliate or digitate,
rarely simple Group C
- bb. Leaflets denticulate or serrate Group D

Group A

Herbs climbing by tendrils or by their twining stem.

- a. Stem twining; leaves trifoliate.
 - b. Calyx subtended by 2 bracts 22. Phaseolus, p. 104
 - bb. Bractless 23. Amphicarpa, p. 104
- aa. Climbing by tendrils; leaves mostly with
an even number of leaflets.
 - c. Calyx lobes much longer than the tube,
much dilated and rather foliaceous... 21. Pisum, p. 104
 - cc. Calyx lobes narrow and shorter.
 - d. Keel abruptly bent upwards around
the upper third 20. Lathyrus, p. 102
 - dd. Keel straight, merely a little
incurved at the tip 19. Vicia, p. 101

Group B

Non-climbers, with pinnate leaves and entire leaflets.

- a. Shrubs.
 - b. Leaves even-pinnate 11. Caragana, p. 84
 - bb. Leaves odd-pinnate 9. Amorpha, p. 82
- aa. Herbs.
 - c. Stamens 5; flowers in compact terminal
cylindric racemes 10. Petalostemon, p. 83
 - cc. Stamens 10; racemes axillary and
usually loose.
 - d. Stemless 13. Oxytropis, p. 95
 - dd. Stem well developed.
 - e. Flowers in a lax, globose head,
or solitary.
 - f. Inflorescence subtended by
a bract, or the flower
solitary 7. Lotus, p. 80
 - ff. No bract under the head...
..... 15. Coronilla, p. 100
 - ee. Inflorescence elongate.
 - g. Fruit catchy, by hooked
prickles 14. Glycyrrhiza, p. 99
 - gg. Fruit not catchy.
 - h. The legume constricted
into a chain of articles
which disarticulate at
maturity 16. Hedysarum, p. 100
 - hh. Legume obviously a
single unit.
 - i. Legume sulcate
dorsally or not

- sulcate12. Astragalus, p. 84
 ii. Legume sulcate
 ventrally. One
 species of... 13. Oxytropis, p. 95

Group C

Non-climbers with trifoliate or digitate leaves, exceptionally reduced to a single leaflet. Leaflets entire.

- a. Stemless 12. Astragalus, p. 84
aa. Stem well developed.
 b. Flowers solitary or in small axillary
 heads 7. Lotus, p. 80
 bb. Flowers in terminal racemes.
 c. Leaves all digitate 2. Lupinus, p. 74
 cc. Leaves all or in part trifoliate.
 d. Leaves part trifoliate, part
 5-foliate 8. Psoralea, p. 81
 dd. Leaves all trifoliate.
 e. Terminal leaflet clearly
 petiolulate 17. Desmodium, p. 101
 ee. All leaflets sessile.
 f. Leaflets conspicuously
 dark punctate, narrowly
 oblanceolate 8. Psoralea, p. 81
 ff. Leaflets not punctate
 and much wider... 1. Thermopsis, p. 73

Group D

Non-climbers, the leaflets denticulate or serrate.

- a. Leaves pinnate 16. Cicer, p. 101
- aa. Leaves trifoliate.
 - b. Inflorescence contracted into a dense head; flowers marcescent 6. Trifolium, p. 79
 - bb. Flowers in loose to dense racemes, the petals mostly deciduous.
 - c. Fruit straight 5. Melilotus, p. 78
 - cc. Fruit strongly asymmetrical to spirally twisted.
 - d. Legume merely asymmetrical, nearly straight 3. Trigonella, p. 76
 - dd. Legume strongly falcate to spirally twisted 4. Medicago, p. 76

1. THERMOPSIS Br.

Stamen 10, all free. The legume very flat and curved.

1. T. rhombifolia (Pursh) Rich. -- Golden Bean, Bush-Pea
-- Very snowy in late spring, forming patches of yellow flowers
in the prairie. Perennial stoloniferous herb 1-4 dm high,
bearing only one raceme. Leaves trifoliate, the leaflets va-

riable, mostly obovate, entire. Flowers 2 cm long, yellow, in a terminal raceme. Legume 5-12 cm long, mostly semi-circular. Second half of spring. Common, specially on light soils. -- Man-Alta-(BC), US.

The name is often credited to Nuttall ex Pursh, but this seems to be an unwarranted assumption as Pursh gives no credit to Nuttall, neither for the name, nor for the diagnosis.

2. LUPINUS L.

LUPINE

Calyx bilobed; leaf digitate; stamens 10, fused in a single group by their filaments; anthers dimorphous, alternately oblong and globular.

a. Annual, less than 2 dm high 5. L. pusillus
aa. Perennials, mostly taller.

b. Legume 3-5 cm long; flowers mostly 12-16 mm long.

c. Larger leaflets 6-10 cm long and acute at tip 1. L. polyphyllus

cc. Shorter and rounded at tip 2. L. nootkatensis

bb. Shorter, the legumes 1.5-2.5-(3.0) cm long and the flowers mostly 8-12 mm long.

d. Leaflets glabrous to more or less

strigose above 3. L. argenteus

dd. Densely strigose to sericeous or

velvety 4. L. sericeus

1. L. polyphyllus Lindley -- Leaflets longest and the lower and basal leaves with petioles 3-6 times longer than their leaflets. Mostly 5-10 dm high. Herbage glabrous to hirsute, the hairs usually yellowish, but the leaflets always glabrous above. Flowers blue, in a single terminal raceme. First half of summer. Moist open sites in the mountains. -- Aka, NF-(SPM), NS-O, swAlta-BC, US, Eur.

Eastern reports are based on escapes from cultivation, not natural disjunctions.

2. L. nootkatensis Donn -- Generally smaller than the first and only 2-5 dm high, the petioles less than twice as long as the leaflets, the latter oblanceolate and rounded at tip. Herbage densely long villous. Early summer. Lush wet meadows towards timberline. -- sAka, (NF), wNS, swAlta-BC.

Reports for the U.S.A. are questionable. All U.S. specimens so-called that we have examined proved to belong to other species. Eastern Canadian occurrences represent escapes from cultivation.

3. L. argenteus Pursh var. argenteus (f. albiflorus Boivin, var. argophyllus AA., var. Macounii (Rydb.) Davis) -- Tufted perennial 3-5 dm high. Petioles about as long as the leaflets. Leaflets 6-9, narrowly oblanceolate to oblinear, usually conduplicate, less pubescent above than below. Flowers normally blue, in a terminal raceme. Standard usually glabrous dorsally. Legume yellowish-silky. Early to mid summer. Table-

lands and hillsides. -- swMan-sAlta, US.

Adventive at Melita, indigenous from Rockyglon westward.

A white-flowered form is sporadic. The type of the species was such an albino. Three other varieties of lower stature or smaller flowers also occur in the western U.S.A.

Usually subdivided in an endless series of minor segregates of doubtful value. The following L. sericeus may be distinguished as a pubescence extreme.

L. parviflorus Nutt. has recently been reported by Dunn 1967 as widespread across western Canada, a distribution map showing 2 localities in southern Saskatchewan. Both specimens mapped and annotated (DAO) are at hand and they fail to exhibit the smaller flowers in a denser raceme, the shorter petioles, and other distinguishing features from L. argenteus. The same dot map carries no dot to match his Alberta report, no specimen cited, no precise locality stated, and we have not encountered any Alberta specimen under that name.

L. alpestris Nelson is here reckoned as a synonym of A. argenteus, but in a recent treatment by Dunn 1967 it is presented as a putative hybrid of L. argenteus X L. caudatus Kell., with 3 mapped localities in Canada. All 3 localities are outside the range of both parents. Two of the mapped specimens are at hand (DAO); the Melita sheet has been returned to L. argenteus while the Waterton collection has been revised to L. sericeus. Correct disposition of the other sheet has not yet been ascertained.

4. L. sericeus Pursh var. sericeus (L. flexuosus Lindley; L. lepidus A.A.) -- Similar, the whole plant more densely pubescent; the leaflets densely strigose to sericeous or velvety above. Lower petioles longer, 2-3 times as long as their leaflets. Flower blue, the standard usually densely pubescent dorsally. First half of summer. Foothill and montane prairies. -- swAlta-BC, US -- F. leucanthus Boivin -- Flowers white. -- swAlta.

F. leucanthus f.n., petalis albis. Type: Boivin & Alex 9501, Montagne de Lait, 10 milles au sud ouest de Milk River, 25 juin 1952 (DAO). Not to be confused with var. asotinensis (Phillips) C.L. Hitchc., also white-flowered, but the standard less pubescent.

In our var. sericeus the hairs hardly ever exceed 1 mm, while in southwestern Yukon a var. Kuschei (Eastwood) Boivin is normally clothed with hairs up to 1-3 mm long.

A distribution map by Phillips 1955 carries 2 dots in southeastern B.C., 6 across southern Alberta, and 2 in southwestern Saskatchewan. However, the text on page 168 includes only Alberta and B.C. in the range, which leads one to suspect that the Saskatchewan dots may be so many lapsus calami. One may also note that the dots on this and other maps in the same paper are more or less equidistant, a rather improbable type of plant distribution.

At least some of the specimens previously reported as L. lepidus Douglas or L. minimus Douglas have since been revised

to L. sericeus. However it may be that at least one collection from Waterton (CAN) may prove to belong to L. lepidus.

L. leucophyllus Douglas was reported for Alberta and B.C. by Phillips 1955 by means of an equidistant-dotted map. See comment above. Some Alberta specimens (DAO) originally identified as L. leucophyllus have since been revised to L. sericeus. A more recent report by Dunn 1967 from Lumbly, B.C., has not been investigated.

5. L. pusillus Pursh var. pusillus (L. Kingii AA.) -- Erect annual, 2 dm high or less, densely velvety throughout, often much branched. Leaflets 3-7 entire, narrowly oblanceolate to linear. Flowers in few-flowered terminal racemes. Corolla white, tinted blue upwards. Legume velvety. Late spring to early summer. Loose sands. -- swS-sAlta, US.

J.M. Macoun 1895 also reports L. arcticus Watson for Medicine Hat. This is undoubtedly based on a misidentification but we have not succeeded in locating the corresponding specimen, at CAN, HUH or elsewhere.

An Alberta report of L. leucopsis Agardh by Budd 1957 was based on material (SWC; DAO, photo) now revised in part to L. sericeus and partly to L. polyphyllus.

3. TRIGONELLA L.

Much like Melilotus, but the legume asymmetrical and dehiscent. Petals more or less marcescent over the young fruit.

1. T. COERULEA (L.) Ser. -- Sweet Trefoil (Mélilot bleu) -- Similar to Medicago sativa, but the legume nearly straight. Annual, glabrous or nearly so. Flowers in short dense axillary racemes borne on a long peduncle. Corolla sky-blue to violet. Legume ± 7 mm long, semi-obovate to nearly sigmoid. Summer and fall. Locally adventive in crops and around gardens. -- O-BC, (Eur).

4. MEDICAGO L.

MEDICK

Similar to Melilotus, but the indehiscent legume falcate to spirally coiled.

a. Annual with small yellow flowers 3. M. lupulina
aa. Perennials.

b. Fruit spiny; flowers yellow, about

4 mm long 4. M. hispida

bb. Not spiny; flowers larger.

c. Fruit falcate; flowers yellow 2. M. falcata

cc. Fruit spirally coiled; flower
colour variable 1. M. sativa

1. M. SATIVA L. -- Alfalfa, Lucerne (Luzerne, Lentine) -- Legume small, coiled into a tight spiral. Diffuse-branched perennial about 1 m high. Leaflets finely serrate above the middle. Flowers in tight axillary racemes. Corolla 7-10 mm long, of variable colour, nearly always blue or violet tinted. All

summer. Cultivated and often escaped to waste lots, roadsides, etc. -- Mack, (Aka), NS-BC, US, Eur -- F. ALBA Benke -- A casual form with white flowers, these sometimes turning blue in drying. -- Q, Man-Alta

2. *M. FALCATA* L. var. *FALCATA* -- Yellow Lucerne, Sickie-Medick (Luzerne jaune, Luzerne sauvage) -- Very much like the preceding but the flowers always yellow and the legume merely falcate. Leaflets finely serrate near the tip. Corolla 6-8 mm long. All summer. An occasional escape, especially along roadsides. -- (Aka), Q-BC, (US), Eur.

Highly variable. In a recent monograph by J.L. Bolton, it is subdivided into 19 varieties.

3. *M. LUPULINA* L. (var. *glandulosa* Neilreich) -- Black Medick, Nonesuch (Minette, Triolet) -- Legume small, black and spirally coiled at the tip. Annual or biennial with decumbent or prostrate stems, 1-6 dm long. Flower yellow, 2-3 mm long. Legume ovoid, strongly asymmetrical. All summer. An innocuous introduction of grassy places along roads, rivers, etc. -- (G), Mack, (Aka), NF-SPM, NS-BC, US, (CA, SA), Eur, Afr.

4. *M. HISPIDA* Gaertner (*M. polymorpha* AA.) -- Bur-Clover (Minette punaise) -- Pod spirally coiled and becket marginally with an outward ring of hooked spines. Flower 3.5-4.5 mm long, yellow. Spines about 1.5 mm long. All summer. A rare weed: Spalding. -- (Aka), Q-O, S, BC, US, SA, Eur.

M. polymorpha L., Sp. Pl. 2: 779.1753 fell into disuse more than a century ago as each of the original elements of this entity came to be known by a name of its own. In Rhodora 50: 5. 1956 it was correctly pointed out the linnean name should be typified and restored for one of the original elements. The name was then duly restored but not typified by one of the original elements, it was instead typified by a later accretion, a var *nigra* L., published eight years later in the Mantissa Plantarum. The reason for this procedure was apparently to avoid a typification that would coincide with any of the varieties originally named by Linnaeus; the rationale behind this self-imposed restriction not being made clear. The restriction is, at least in this case, inconsistent with the long accepted principle of priority in nomenclature.

Since Linnaeus had subdivided *M. polymorpha* in 13 varieties and provided names for each one, including the alpha variety, it would seem unavoidable that *M. polymorpha* be typified in the sense of one of the original linnean varieties, if this species is to be typified by one of its original elements. Typification by a later accretion is unacceptable.

There is some variation in the linnean technique of designating varieties. Most of the time the existence of an alpha variety is merely implied by Linnaeus and only the other varieties are expressly dealt with. There seems to be no doubt that this was the procedure followed by Linnaeus; witness the various cases (p. 689, 940, etc.) where no alpha variety is published as such, yet is discussed in the notes. The other varieties are, however, designated by consecutive Greek letter starting with β . A "r" man

triviale" is often appended to the Greek letter, or else the variety is merely individualized by its diagnosis. Once in a while the alpha variety was also designated by its own greek letter or even decorated also with a nomen triviale. The latter was the situation under M. polymorpha in its place of original publication.

Now it is fairly obvious from perusal of the Species Plantarum that Linnaeus generally intended the alpha variety to be the main phase of a species. Exceptions are few and are mainly discussed by Sprague 1955 and Stern 1957. Unless it can be demonstrated that M. polymorpha is one of the exceptions, we are of the opinion that it should be typified in the sense of its alpha variety. On that basis, the relevant synonymy for the two main taxa concerned is as follows.

M. polymorpha L. sensu stricto, M. polymorpha L. α orbicularis L., Sp. Pl. 2: 779.1953; M. orbicularis (L.) Bartalini, Cat. Piante Siena 60.1776.

There are two syntypes in the Linnaean Herbarium, sheets 933.14 and 933.15, both bearing large mature legumes.

M. hispida Gaertner, Fruct. Sem. Pl. 2: 349, 1791; M. polymorpha L. var. nigra L., Mant. Pl. 2: 454.1771; M. polymorpha sensu Shinnars, Rhodora 58: 5-12. 1956, sensu Clapham 1962.

Both species are cultivated in Canada, both occur as infrequent casual escapes.

See Bailey 3:107-8. 1955 for another similar problem in typification.

5. MELILOTUS Miller

SWEET CLOVER

Herbs with trifoliate leaves and similar to Trifolium, but the flowers in elongate racemes. Legume straight, indehiscent.

- a. Flowers 2-4 mm long; calyx lobes deltoid to triangular.
 - b. Pedicel 2-3 times longer than the calyx... 3. M. wolgica
 - bb. Somewhat shorter than the calyx 4. M. indica
- aa. Larger, 4-7 mm long; calyx lobes narrower, lanceolate to linear.
 - c. Flowers yellow 1. M. officinalis
 - cc. Flowers white 2. M. alba

1. M. OFFICINALIS (L.) Lam. var. OFFICINALIS -- Yellow Sweet Clover (Trèfle d'odeur jaune) -- Biennial, branchy, about 1 m high. Flowers 4.5-7.0 mm long, yellow, drooping in long racemes. Legume black. All summer. Cultivated and frequently escaped, usually found with the following and quite distinct when fresh, although the flowers may fade in drying. -- Mack-Aka, NF, NS-BC, US, Eur.

Many varieties are recognized in the Old World, such as a var. maximus (Langr.) O.E. Schulz with longer flowers and fruits, a var. micranthus O.E. Schulz with smaller flowers and fruits, etc.

2. M. ALBA Desr. var. ALBA -- White Sweet Clover (Trèfle MEDICAGO)

diodeur blanc) -- Very much like the preceding. Taller, up to 2.5 m high. Flowers white. Legume brownish. Summer. A common escape, especially in evidence along new roadsides, where it is sometimes seeded in. -- (G), Mack-Y-(Aka), L-SPM, NS-BC, US, (CA), Eur.

Still taller is var. arboreus Castagne from western Asia which may reach a height of 6 m!

3. M. WOLGICA Poiret -- Pedicels longest, commonly about as long as the flower, the latter 2.5-4.0 mm long. Calyx 1.0-1.5 mm long, its lobes short and narrowly to broadly deltoid. Corolla white. First half of summer. Rare escape from experimental plots: Brandon. -- Man, (Eur).

4. M. INDICA (L.) All. -- Somewhat smaller than the first two, with smaller flowers. Pedicels less than 1 mm long. Fruit ovoid, strongly verrucose with very sinuous nerves. First half of summer. Sometimes cultivated and a rare weed of cultivated or waste land: Brandon. -- NS, Man, BC, Eur, (Afr).

6. TRIFOLIUM L.

CLOVER

The herb with the typical trifoliate leaves. Leaflets denticulate. Inflorescence condensed into a pseudo-head. Corolla marcescent. The keel and wings usually more or less fused together.

- a. Head subtended by an involucre of two trifoliate leaves 5. T. pratense
- aa. No involucre.
 - b. Flower yellow.
 - c. Central leaflet with a petiolule 1.5-4.0 mm long, at least twice as long as those of the lateral leaflets 1. T. procumbens
 - cc. All leaflets equally sessile 2. T. agrarium
 - bb. White to purple.
 - d. More or less erect and very branchy ..
..... 3. T. hybridum
 - dd. Creeping, the stems branching near the base only 4. T. repens

1. T. PROCUMBENS L. -- Quite similar to the next, but annual and the stipules ovate, less than 1 cm long. Flower 3.5-4.5 mm long. Summer. Weed: Souris. -- (Aka, NS-BC)-2-Man, (BC), US, Eur, (Afr).

All mentions of T. procumbens for Saskatchewan are based on Breitung's collection at Bannock (DAO). This has been revised to T. agrarium and is the only collection of the latter for the province.

2. T. AGRARIUM L. -- Yeo Clover (Trèfle jaune) -- Erect or nearly so, 1-4 dm high, tufted, biennial, hispid. Stipules lanceolate, 1 cm long or more. Leaflets oblanceolate, 1.0-1.5 cm long. Flowers yellow, 5-6 mm long, marcescent, becoming brown and reflexed. Early summer. Cultivated and rarely escaped around farm buildings, etc.: Bannock, Coleman. -- (Aka, L)-NF-SPM, NS-O, S-(Alta)-BC, US, Eur.

3. *T. HYBRIDUM* L. -- Alsike (Trèfle Alsike) -- Erect or nearly so, 1-4 dm high, tufted, biennial or perennial, puberulent. Upper stem leaves all subtending either a branch or an inflorescence. Flowers more or less pinkish, pendent after anthesis. Late spring to end of summer. Cultivated and frequently escaped along roadsides, etc. -- (Mack)-Y-Aka, L-(NF)-SPM, NS-BC, US, Eur -- *F. PROLIFERUM* Dore -- Floral parts replaced by a mass of small scales. Known from Beaverlodge. -- (Q-O, Alta-BC) -- *F. ALLIOIDEUM* Dore -- Also a local form, has a mis-shaped corolla that remains included in the calyx and never opens: Sylvania. -- S.

4. *T. REPENS* L. var. *REPENS* -- White Clover (Trèfle blanc) -- The leaflets carry near the base a very obvious white marking shaped like a Λ (= lambda). Perennial, creeping and rooting at the nodes. Shoots of the year floriferous but simple, the branches arising only the following year. Inflorescence globular, borne on a long erect peduncle. Flowers white to pinkish, drooping after anthesis. Late spring and summer. Often grown in lawns and escaping to wet places, ditches, roadsides, waste lots, etc. -- G, Mack-Aka, L-SPM, NS-BC, US, Eur.

Some European authors will distinguish a number of varietal segregates, such as a much smaller var. alpinum Schur, a spreading-pubescent var. alpestre Gussone, and many others.

5. *T. PRATENSE* L. -- Red Clover, Honeysuckle-Clover (Trèfle rouge) -- The heads are subtended by usually two large trifoliate bracts, nearly as large as the leaves. Perennial, hispid, tufted, decumbent to more or less erect, 3-6 dm high. All upper stem leaves subtend either a branch or an inflorescence. Leaflets marked above by a pale green or purple Λ . Flowers red to purple, remaining erect. Calyx teeth very long and spinescent after anthesis. Late spring and summer. An infrequent escape along fences, etc. -- (G), Y-Aka, L-NF-(SPM), NS-BC, US, Eur -- *F. LEUCOCHRAEUM* Asch. & Pohl -- Flowers white. -- Q, Man.

7. *LOTUS* L.

Anther filaments dilated towards the summit. Trifoliate and the flowers in heads as in Trifolium, but the leaflets entire and the heads few-flowered or even reduced to a single flower. Inflorescence subtended by a bract. Legume dehiscent.

a. Flowers solitary 3. L. Purshianus
aa. In small heads.

b. Calyx lobes 1.5-2.0-(2.5) mm long.... 1. L. corniculatus

bb. Larger, 2.5-4.0 mm long; leaflets

typically larger 2. L. pedunculatus

1. *L. CORNICULATUS* L. -- Birdsfoot-Trefoil (Patte d'oiseau) -- Leaf pinnate with 5 leaflets, two of which are borne near the stem and resemble a pair of large stipules at the base of a trifoliate leaf. Tufted, branchy perennial 2-6 dm high. Leaflets 3-10 mm long. Inflorescence a few-flowered head, axillary on a long peduncle, the bract subtending the head small and simple to trifoliate. Corolla two-toned: pale and brownish yellow. Legu-

me 2-4 cm long. Summer. An infrequent escape of waste places, etc. --NF-SPM, NB-Man, Alta-BC, US, (Eur).

The only record for Saskatchewan, Blue Jay 20:118. Sept. 1962 was based on Wagner & Ledingham 3112, Regina, roadside ditch, plant over several square yards, July 17, 1962 (NY; DA, photo). It has since been revised to L. pedunculatus and is the only record of the latter for our area.

2. L. PEDUNCULATUS Cav. (L. uliginosus Schkuhr) -- Closely resembling the first, but generally larger. Up to 11 dm high. Leaflets oblanceolate, (5)-10-15-(20) mm long. Calyx lobes 2.5-4.0 mm long, nearly always very long ciliate. Summer. Recently introduced and still rarely escaped: Regina. -- NS, NB-Q, S, BC, US, (Eur, Afr).

3. L. Purshianus (Bentham) Clem. & Clem. (L. americanus (Nutt.) Fisch.; Medicago americana (Nutt.) Piper) -- Spanish Clover -- Flower solitary, subtended by a bract reduced to a single leaflet. Erect, pilose annual, branched above. Stipules minute and fugaceous. Calyx about as long as the pinkish corolla. All summer. Ditches and creek banks. -- sMan-seS, swBC, US, (CA).

Highly variable south of the border and many debatable segregates have been proposed, but more recent floras have taken to dealing with this species *sensu amplo*. While this may be a justifiable procedure for the U.S. material, the Canadian specimens clearly fall into a pair of readily recognisable entities with good morphology and a wide geographical discontinuity. These may be defined as follows:

L. Purshianus -- Leaves all trifoliate, peduncle much longer than the flowers; single-stemmed.

L. unifoliolatus (Hooker) Bentham -- Branch leaves mostly unifoliate; peduncle shorter than the flower; mostly many-stemmed. Southeastern B.C.

8. PSORALEA L.

Anthers alternately dimegueth. Legume indehiscent, one-seeded. Leaves trifoliate to digitate, usually punctate.

a. Leaves all trifoliate 1. P. lanceolata
aa. Some leaves digitate.

b. Silvery and silky appressed-pubescent
cent 2. P. argophylla

bb. Long spreading hirsute 3. P. esculenta

1. P. lanceolata Pursh var. lanceolata (Psoralidium lanceolatum (Pursh) Rydb.) -- Scurf-Pea -- Finely punctate throughout in brownish black. Long stoloniferous sand binder. Leaves trifoliate. Leaflets narrowly oblanceolate, entire, glabrous above. Inflorescence small, axillary. Corolla small, white, with a large blue dot on the keel. Legume 4-6 mm long, coarsely rugose-punctate. All summer. Dry sands. --swS-sAlta, US.

Ours have the legumes pilose with hairs 0.5-1.0 mm long. Specimens from the more western parts of the U.S. range exhibit legumes more densely pilose and the hairs more uniformly 1.0 mm

long; these are barely distinguishable as var. Purshii (Vail) Piper.

2. P. argophylla Pursh (Psoralidium argophyllum (Pursh) Rydb.) -- The whole plant silvery-shiny in the sun, being densely appressed silky. Tap root thickened, weakly linked to the erect stem. The fine, dark green punctuation hidden under the pubescence. Main leaves with 5 leaflets, the other trifoliate. Leaflets oblong to oblanceolate, entire. Flowers small, in an interrupted spike. Corolla blue, drying brown. Summer. Steppes and hillsides. -- sMan -seAlta, US.

3. P. esculenta Nutt. (Pediomelum esculentum (Pursh) Rydb.) -- Cree-Turnip, Breadroot (Navet de prairie, Pomme de prairie, Pomme blanche) -- Very long villous throughout, not punctate. Taproot thin and fragile in the upper 5-10 cm, thickened below into an oblong, starchy, edible tuber. Leaves all or mostly with 5 leaflets, these oblanceolate, glabrous above. Flowers in a dense raceme, pale blue with a dark blue spot. Legume enclosed in the long calyx. Mid spring to mid summer. Hillsides, especially along coulees. --sMan-Alta, US.

9. AMORPHA L.

FALSE INDIGO

Corolla reduced to a single petal, the 10 stamens fused at the base only. Leaves pinnate, punctate. Leaflets stipellulate.

a. Densely short villous, often grayish 1. A. canescens
aa. Glabrous to sparsely pubescent.

b. Leaflets 1 cm long or less 2. A. nana

bb. Obviously longer 3. A. fruticosa

1. A. canescens Pursh -- Leadplant, Shoestrings -- The year's shoots numerous, herbaceous, mostly simple, arising from a shrubby base. Leaf almost sessile. Leaflets crowded and very numerous, mostly 30-50, oblong, entire, about 1 cm long, much paler below. Flowers dark purple. Pod small, canescent. Mid summer. Dry hills, mostly on sandy or rocky ground. -- wO-sMan, US.

2. A. nana Nutt. (A. microphylla Pursh) -- Shoestrings, False Indigo -- Branchy shrub less than 1 m high. Leaflets quite numerous, oblong, light green on both sides, conspicuously glandular-punctate below and glabrous or nearly so. Pod small, glabrous, strongly glandular-punctate. First half of summer. Hilly prairies, mostly on the Prairie Coteau. -- sMan, US.

3. A. fruticosa L. var. angustifolia Pursh -- Bastard Indigo, Indigo-Bush (Indigo bâtard) -- Shrub, usually 1-2 m high. Pubescence rather strigose. Leaves with 5-10 pairs of leaflets, these oblong, 1-3 cm long. Petal purple-blue. Pod with conspicuous, brown, glandular spots. First half of summer. Galerie - forests of the Red River to the Sault à la Biche. -- swQ, scMan, US, CA.

In the more eastern var. fruticosa the pubescence of the younger parts is of spreading and somewhat longer hairs.

10. PETALOSTEMON Mx.

PRAIRIE CLOVER

Stamens only 5, alternating with the 4 petaloid staminodes and the lone petal. Flowers in very compact terminal racemes, looking much like a cylindric to globular head. Leaves pinnate, punctate. Pod small, indehiscent.

- a. Leaflets 11-13 1. P. villosum
 aa. Leaflets fewer, 3-7.
 b. Flower violet-pink 2. P. purpureum
 bb. Flower white 3. P. candidum

1. P. villosum Nutt. -- The large fleshy taproot like a red-brick carrot. Tufted perennial densely soft villous all over. Leaflets 0.5-1.0 cm long, black-punctate dorsally. Raceme 2-6 cm long. Calyx long villous, neither glandular nor punctate. Flowers pink. After mid-summer. Sandy blowouts. -- swMan-scs, US.

2. P. purpureum (Vent.) Rydb. var. purpureum -- Thimbleweed, Red Tassel-Flower -- Tufted perennial, glabrous to somewhat pubescent. Leaflets 3-5, narrow, 1-2 cm long, punctate dorsally with about 6 rows of purple dots. Flowers pale pink to magenta. Before mid-summer. Dry open places, especially if hilly. -- O-sAlta, US -- F. albiflorum Moor & McGregor -- Flowers white or nearly so, Local: Carey. -- Man, (US) -- Var. molle (Rydb.) Boivin (var. pubescens (Gray) Boivin; P. mollis Rydb.) -- Stem and foliage grayish-villous. Hillsides of major coulées. -- swS-sAlta, (US).

Var. molle (Rydb.) stat. n., P. mollis Rydb., Mem. N.Y. Bot. Gard. 1: 238. 1900; P. purpureus mollis (Rydb.) A. Nelson ex Coulter & Nelson, Man. Bot. Rocky Mts. 299. 1909; P. purpureum (Vent.) Rydb. var. pubescens (Gray) Boivin, Nat. Can. 87: 43. 1960 nec P. purpureum (Vent.) Rydb. var. pubescens (A. Nelson) Harrington, Man. Pl. Colo. 319, 641. 1954.

Var. purpureum is native in our area but adventive in Ontario at Ingolf and possibly also at Pt. Edward.

3. P. candidum (W.) Mx. (var. oligophyllum (Torrey) Herman, var. occidentale Gray; P. occidentale (Gray) Fern.; P. oligophyllum (Torrey) Rydb.) -- White Prairie-Clover, White Tassel-Flower -- Much like the preceeding and usually growing with it, but white-flowered. Stems and foliage glabrous. Leaflets 5-(7), with dark-green spots on the back. Calyx with a ring of 10 or more large brown glands. Mid summer. Dry places, usually on hillsides. -- wO-sAlta, US.

Willdenow's publication precedes Michaux' by one year, hence the author reference used above. See Article 30 of the International Code of Botanical Nomenclature for the relevant dates of publication. Now this change of authorship should not affect the application of the name as Willdenow's type is presumably a duplicate of Michaux' collection.

Many authors will distinguish a more western var. oligophyllum (or var. occidentale). Sometimes treated as a distinct species, in which case the correct name is P. virgatum Nees because

earlier. However we have not been able to distinguish clearly among our Canadian material a more western var. oligophyllum characterized by larger leaflets, longer peduncle, longer bracts, pubescent calyx, etc.

The various morphological types have the same range in our area and the intermediates are numerous. The primary character of calyx pubescence showed about 1/5 of intermediates and the remainder of the material from Manitoba eastward was about equally divided between the two types of pubescence while the more western material showed a preponderance of pubescent calices. Other characters were even less clearly segregated geographically and were not particularly linked together. Obviously all we can detect here is a difference in relative frequency of characters and it is not possible to detect a geographically restricted type unless one is willing to shift the emphasis now to one character, now to another, in accordance with the place of origin of the specimen and a preconceived distributional pattern. Our U.S. material is too limited and we can not confidently state that our observations are equally applicable south of the border.

11. CARAGANA Lam.

Shrubs with paripinnate leaves, that is the terminal leaflet is lacking and the rachis merely ends into a spiny point.

1. C. ARBORESCENS Lam.-- Caragana (Caragana, Arbre aux pois) -- Stoloniferous shrubs, usually 1-3 m high. Stipules somewhat spinescent. Flowers yellow, few, borne on the short shoots. Legume pendent. Mid spring. Much planted, persistent and more or less spreading by roots and perhaps also by seeds. -- (Y), Q, Man-Alta-(BC), Eur.

12. ASTRAGALUS L.

MILK-VETCH

A generalized type of Leguminosae. Perennial herbs with pinnate leaves and entire leaflets. Flowers papilionaceous with fused sepals and free petals. Stamens in two groups, one stamen being free, the other 9 fused by their filaments. Flowers in axillary racemes. Leaflets usually not punctate. Stem usually well developed.

- a. Stemless or the stem short and poorly developed, usually less than 1 dm long, no longer than the peduncle of the inflorescence Group A
- aa. Stem well developed, usually more than 1 dm long.
 - b. Inflorescence very compact, almost in the manner of a Trifolium Group B
 - bb. Inflorescence looser and more elongate, often secund.
 - c. Flowers small, 4-10 mm long Group C
 - cc. Flowers longer.
 - d. Flowers very long, 15-30 mm long Group D
 - dd. Flowers middle-sized Group E

Note also that species 1-17 have unilocular legumes while 18 to 28 have a false partition and are more or less bilocular.

Group A

Stemless or the stem poorly developed, commonly no longer than the peduncles, and mostly less than 1 dm long.

Not to be confused with Oxytropis which has the leaves pinnate and the leaflets slightly asymmetrical at base.

- a. Not more than 3 leaflets.
 - b. Trifoliate 16. A. gilviflorus
 - bb. Leaf reduced to a single leaflet 12. A. spathulatus
- aa. Leaves pinnate.
 - c. Flowers yellow, with or without a purple patch on the keel.
 - d. Flowers 8-9 mm long 5. A. lotiflorus
 - dd. Flowers 20-30 mm long 15. A. Purshii
 - cc. Whitish to mauve or purple.
 - e. Flowers 14-20 mm long 14. A. missouriensis
 - ee. Obviously smaller.
 - f. Ovary and fruit glabrous to lightly white strigose 8. A. miser
 - ff. Densely black pubescent.
 - g. Inflorescence dense at flowering time, elongating in fruit 18. A. alpinus
 - gg. Inflorescence elongate at flowering time 9. A. Bourgovii

Group B

Flowers in compact heads, almost like a Trifolium.

- a. Tufted 27. A. adsurgens
- aa. Finely stoloniferous 28. A. danicus

Group C

Flowers small, 4-10 mm long; stem well developed.

- a. Leaflets sharp pointed and spinescent ... 10. A. Kentrophyta
- aa. Leaflets not spinescent.
 - b. Raceme on a short peduncle, 1-2 cm long 11. A. vexilliflorus
 - bb. Peduncle much longer.
 - c. Calyx teeth broadly deltoid and \pm 0.5 mm long 2. A. americanus
 - cc. Calyx teeth much narrower and longer.
 - d. Peduncle short, much shorter than its raceme 7. A. tenellus
 - dd. Peduncle about as long as to much longer than its raceme.
 - e. Leaflets numerous, mostly

- in 8-15 pairs.
- f. Pubescence white 6. A. flexuosus
- ff. Black pubescent in the inflorescence.
- g. 4-15 dm high 24. A. falcatus
- gg. Smaller, 3 dm high or less 18. A. alpinus
- ee. Leaflets fewer, mostly in 4-9 pairs.
- h. Stems weak, decumbent 3. A. Bodinii
- hh. Stems ascending to erect.
- i. Stipules not fully encircling the stem 19. A. eucosmus
- ii. Lower stipules fully encircling the stem and * fused together on the other side of the stem.
- j. Remotely flowered ... 8. A. miser
- jj. Flowers closely imbricated at flowering time.
- k. Flowers borne on pedicels 3-4 mm long 21. A. Robbinsii
- kk. Pedicels shorter, less than 3 mm long 20. A. aboriginum

Group D

Flowers large, 15-30 mm long. Stems well developed.

- a. Leaves narrowly pectinate, the segments 2 mm wide or less 13. A. pectinatus
- aa. Leaves obviously pinnate.
- b. Stem stiffly long-hirsute 22. A. Drummondii
- bb. Pubescence shorter and more or less appressed.
- c. Calyx more or less black-pubescent 29. A. crassicarpus
- cc. Entirely white-pubescent 23. A. racemosus

Group E

Flowers middle-size; stem well developed.

- a. Flowers white to yellow.
- b. Flowers remote 8. A. miser
- bb. Densely flowered.
- c. Flowers yellow, ascending 26. A. Cicer
- cc. Flowers white to lightly greenish.

- d. Calyx teeth broadly deltoid and
± 0.5 mm long 2. A. americanus
- dd. Longer and narrower.
 - e. Stipules broad-based, short-
connate on the other side of
the stem 25. A. canadensis
 - ee. Narrow-based and free from
one another 4. A. neglectus
- aa. Flowers pink to purple.
 - f. Standard very wide, almost orbicular 1. A. iochrous
 - ff. Narrower, the flower ± lanceolate.
 - g. Leaflets all or mostly linear and
2 mm wide or less 8. A. miser
 - gg. Leaflets wider.
 - h. Most of all leaves with 15
leaflets or less 21. A. Robbinsii
 - hh. Mostly 15 or more leaflets.
 - i. Pod sulcate, black hairy 18. A. alpinus
 - ii. Bisulcate and white
strigose 17. A. bisulcatus

The key above stresses the flowers. The text below stresses the very characteristic fruits.

1. A. IOCHROUS Barneby (Swainsona salsula (Pallas) Taub.)
-- Pod inflated and very large, very long stipitate. Coarse, tufted and long stoloniferous, the stems 4-9 dm long. Racemes elongate, loosely flowered. Pedicels rather long. Flowers about brick red, fading purple, with a very widely spreading standard. Legume glabrous, ovoid, about 2 cm long, the stipe about twice as long as the calyx. All summer. Saline shores: Maple Creek, -- S, US, Eur.

Sometimes placed in the Australian genus Swainsonia, sometimes in the monotypic Sphaerophysa. The latter differs from Astragalus merely by a few more hairs on the style and one is tempted to say that the similarities to Astragalus greatly outweigh the difference.

2. A. americanus (Hooker) M.E. Jones (A. frigidus (L.) Gray var. americanus (Hooker) Watson; Phaca americana (Hooker) Rydb.) -- With large pendulous pods, inflated and lanceolate. Stem erect, about 1 m high and mostly solitary, sometimes stoloniferous. Stipules rather large. Flowers white, descendent. Calyx with very low teeth, glabrous or nearly so. Legume pale green, glabrous, about 2 cm long, thin walled, the stipe nearly twice as long as the calyx. First half of summer. Aspen groves and forest margins. -- Mack-Aka, Q-BC, US.

3. A. Bodinii Sheldon var. yukonis (M.E. Jones) Boivin (A. yukonis M.E. Jones) -- The pod small, 5-10 mm long ellipsoid, strigose, sessile, asymmetrical. Tap root with a more or less buried crown, branching into a very large number of weak decumbent stems, often forming circular mats about 1 m across. Raceme few-flowered on a very long peduncle. Corolla mauve to blue.

First half of summer. Grassy places, especially disturbed places. -- Mack-Aka, NF, nMan, nAlta.

Stat. n., A. yukonis M.E. Jones, Rev. N. Am. Sp. Astr. 89. 1923. Our variety has a more elongate and much laxer inflorescence than the more southern typical phase.

The rather large apparent distributional gap across the central part of our area is presumably an artifact resulting from insufficient collecting across northern Saskatchewan.

Macoun 1883 reports A. microcystis Gray for Saskatchewan on the basis of an 1875 collection from the Methye River. No such collection has been located and under that name we have found only the following: Macoun 4300, West of North Saskatchewan River, grassy slopes, Aug. 23, 1873 (CAN; DAO, photo). However, the latter has been revised to A. Bodinii var. yukonis.

4. A. neglectus (T. & G.) Sheldon (A. Cooperi Gray) -- Large sessile pods, inflated and glabrous. Erect perennial about 1 m high, lightly strigose. Inflorescence lax. Flowers white. Legume 1.5-2.5 cm long, ovoid, sessile in the calyx, ascending on a stiff pedicel. Early summer. Open Aspen groves on gravelly soil. -- O-seMan, (US).

Has been reported for northeastern Alberta by Raup 1936. At least his collection 7056 has been revised to A. Bodinii var. yukonis.

The correct name of this entity has given some trouble in the past. Astragalus neglectus (T. & G.) Sheldon 1894 is based on Phaca neglecta T. & G. 1838. The latter is in no way affected by the existence of an earlier Astragalus neglectus Fischer ex Steudel, Nom., ed. 2: 162.1340 since the latter is a nomen nudum. The case of Astragalus neglectus Freyn 1893 and of A. neglectus (Freyn) Freyn 1895 has been recently discussed by Barneby 1964; the first is an inadmissible form, being a binomial to designate a subspecies, while the second is illegitimate as a later homonym. There seems to be no reason to take up A. Cooperi Gray 1856.

5. A. lotiflorus Hooker (Batidophaca lotiflora (Hooker) Rydb.) -- Tufted, the stems very short, 1-3 cm long, with the fruits mostly born among the leaf bases, or some of them on a scape. Plant and pods quite pilose or strigose. Raceme short. Flowers yellow, small. Pod sessile, broadly lanceolate. Mid spring. Gravelly or sandy hillsides. -- swMan-BC, US.

Despite numerous Manitoba reports and many collections under that name, the Treesbank specimens proved to be the only collection east of Regina to be correctly identified. To be searched for along the Agassiz Couleefrom Craven east to Brandon.

6. A. flexuosus (Hooker) Douglas var. flexuosus (Pisophaca flexuosa (Hooker) Rydb.) -- Pod cylindrical, 10-18 mm long, spreading to drooping, straight to falcate, finely pubescent. Tufted plant, gray pubescent. Stems 2-7 dm long. Racemes somewhat secund, the flowers distant. Corolla white to light purple. Early summer. Steppes, especially on light soils. -- sMan-sBC, US.

Native in our area. Probably introduced at Cranbrook which is the only known locality west of us.

Legumes mostly 3-4 mm thick. A more southern variety, var. Greenii (Gray) Barneby has somewhat inflated pods, 5-9 mm thick.

7. A. tenellus Pursh var. tenellus (Homalobus tenellus (Pursh) Britton) -- Pod flat, purple-blotched and usually drying black. The whole plant tending to dry black. Stems 2-7 dm high. Racemes somewhat lax and secund. Flowers whitish, often with a large purplish patch. Legume 8-15 mm long, oblong to oblong-lanceolate, glabrous. Late spring to mid summer. Hillsides and shores. -- sMack-swY, Man-BC, US.

The more southern var. strigosus (Rydb.) Hermann has a strigose ovary and legume, and a flower more consistently small, being 6-7 mm long.

8. A. miser Douglas var. miser -- Flat, drooping pods about 2 cm long. Tufted and the stems very variable in length. Foliage rather thin, the leaflets mostly linear and mostly less than 2 mm wide, strigose on both faces. Flowers distant, white to pale rose or pale blue. Late spring to mid summer. Dry open slopes at low altitude in the Rockies, rare: Waterton. -- Alta-seBC, (US) -- Var. serotinus (Gray) Barneby (A. decumbens Nutt.) Gray var. serotinus (Gray) M.E. Jones; A. serotinus Gray) -- Leaflets glabrous above. Flowers somewhat smaller, the calyx 2-4 mm long and the keel 6-8 mm long. More common: Rockies. -- Alta-seBC, WUS.

9. A. Bourgoyii Gray -- Pods flat, black-strigose and unilocular, otherwise much like A. alpinus and easily confused with it. Also, more densely tufted and less densely flowered. Stems 1-2 dm high. Leaflets finely strigose. Fruiting racemes more or less secund, the pods spreading to drooping. Legume lanceolate, 1.5-2.0 cm long, short stituate, the stipe shorter than the calyx tube. Up to mid summer. Alpine prairies. -- Alta-seBC, US.

10. A. Kentrophyta Gray var. Kentrophyta (Kentrophyta montana Nutt.) -- Quite spinose because of the stiff leaflets ending in a sharp point. Half-buried in loose sand and spreading from a central tap root. Densely strigose, the stems whitish. Stipules connate and forming obvious sheaths 1-2 mm long. Leaves small, mostly with 7 leaflets and sparsely dotted, the dots green to brown. Inflorescence rather small, on a short peduncle. Flowers white, few, 4-5 mm long, often with a purple patch. Legume 5-6 mm long, slightly compressed, narrowly ovoid. Late spring. Loose sands. -- sWS-sAlta, US.

A number of varieties occur further south, of which one may mention var. elatus Watson, a more or less erect plant with more or less acuminate legumes.

11. A. vexilliflexus Sheldon var. vexilliflexus (Homalobus vexilliflexus (Sheldon) Rydb.) -- Much like the preceding and similarly small, the leaves small, with few leaflets, the flowers and fruits also small. But the flowers bluish and the foliage soft. Stems 2 dm high or less, densely tufted, but not buried. Mid spring to mid summer. Eroded badlands. -- swS-sAlta-seBC, WUS.

Leaflets glabrous above. In central Idaho there is a var. nubilus Barneby with leaflets strigose or velvety above.

12. A. spatulatus Sheldon (A. caespitosus (Nutt.) Gray;

Homalobus caespitosus Nutt.) -- Leaf reduced to a single leaflet. Stemless and forming dense convex cushions. Whitish-silky. Leaflets 1-3 cm long, linear. Scapes 3-8 cm high, few flowered. Flower purple, 6-7 mm long. Legume about 1 cm long, flattened, lanceolate, ascending. Mid spring. Badlands. -- swS-sAlta, US.

The name is usually written as spatulatus, but this form would seem to be more in accord with english usage. Spatulatus is the correct latin spelling.

13. A. pectinatus (Hooker) Douglas (Cnemidophacos pectinatus (Hooker) Rydb.) -- Leaf narrowly pectinate rather than pinnate, the remote segments mostly 1-2 mm wide and 2-5 cm long. Stems 2-5 dm long, half decumbent. Flowers 1.5-2.5 cm long, creamy yellow and quite showy. Legume 1-2 cm long, ellipsoid, becoming woody and with prominent sutures. Second half of spring. Steppes and hillsides. -- swMan-sAlta, US.

14. A. missouriensis Nutt. var. missouriensis (Xylophacos missouriensis (Nutt.) Rydb. -- A short-stemmed species with rather large and deeply coloured flowers. The tufted stems 1-10 cm long. Hairs malpighiaceous. Leaflets grayish silky on both faces. Raceme compact in flower, elongating in fruit. Flowers 14-20 mm long, magenta to purple-blue. Calyx 8-11 mm long, including the teeth. Legume 2-3 cm long, chestnut brown, more or less sulcate ventrally. Spring and early summer. Dry prairies. -- swMan-sAlta, US.

Varies further south to a var. amphibolus Barneby with falcate legumes and to a var. minetes Barneby with shorter flowers.

15. A. Purshii Douglas var. Purshii -- The pods white-lanate with a very dense and very long tomentum. In small tufts and stemless, the whole plant densely villous. Flowers few, large, yellow with keel purple-tipped. Legume 1.5-2.0 cm long, ovoid, curved, somewhat sulcate ventrally. Early spring. Steppes on dry hills: Climax, Manyberries. -- swS-sBC, US.

Flower very small, 2-3 mm long, yellow with a purple-tipped keel. Not too clearly distinct from the more western var. glaucescens (Douglas) Barneby with purplish flowers only 1.0-2.5 mm long.

16. A. gilviflorus Sheldon (A. triphyllus Pursh; Orophaca caespitosa (Nutt.) Britton) -- Leaves trifoliate. Stemless, caespitose, forming small dense cushions, silvery-silky throughout. Leaflets 1-3 cm long, oblanceolate. Racemes reduced to 1-2 flowers, subsessile among the leaf bases. Flowers 1.5-3.0 cm long, yellow, purplish on the keel. Legume small, white-lanate, more or less hidden in the calyx. Spring. Eroded hillsides and very showy when in flower. -- (Man)-S-Alta, US.

The Manitoba reports are questionable. The records for Reston and Lyleton have yet to be traced to correctly named specimens. The East Crossing of the Souris River is a North Dakota locality (Woodend) at the mouth of the Willow River.

17. A. bisulcatus (Hooker) Gray var. bisulcatus (Diholcos bisulcatus (Hooker) Rydb.) -- Skunk Weed -- Pod deeply bisulcate ventrally. Malodorous, tufted, 2-7 dm high, finely strigose.

Flowers 11-15 mm long, numerous, in dense racemes, magenta, fading blue, stinking of old urine. Legume 10-15 mm long, pendent, cylindrical, strigose, short-stipitate. Late spring to mid summer. Rolling prairies and steppes, often on saline or selenic soils. -- sMan-Alta, US -- F. albiflorus Boivin. Flowers white, local. -- S.

F. albiflorus f.n. Floribus albis. Type: A.C. Budd 209, Saskatchewan Landing, roadside ditch, white flowered, June 18, 1946 (SCS).

In the southwestern U.S.A. one may find two more varieties with shorter corolla and standard: var. Haydenianus (Gray) Barneby and var. nevadensis (M.E. Jones) Barneby.

18. A. alpinus L. var. alpinus (Atelephragma alpinum (L.) Rydb.) -- Pod black hairy, deeply sulcate dorsally. Tufted and stoloniferous from a deeply buried tap root, and forming loose patches. Stems thin, very short to 4 dm high. Leaflets glabrous to hirsute. Inflorescence black-strigose throughout, long-peduncled, secund, few-flowered, at first dense, elongating in fruit. Calyx tube 2.5-3.5 mm long. Flowers 9-13 mm long, mauve, drying blue, the keel longer than the wings. Legume stipitate, exert, pendent, straight or falcate. Late spring. Alpine prairies, river gravels and disturbed soils. -- (G)-F-Aka. L-(NF), Q-nMan-neS-wAlta-BC, US, Eur -- Var. Brunetianus Fern. (var. labradoricus (DC.) Fern.) -- Calyx tube only 2.0-2.5 mm long. River gravels. -- L-NF, NS-BC, US.

Habitually similar to Oxytropis deflexa var. capitata. The varieties distinguished herewith are defined differently from other current treatments; the resulting distributions are also different. Barneby 1964 places the accent on the strigose pubescence of the calyx. The resulting distribution for var. Brunetianus is much more restricted: NF, WNB-sQ, neUS: but then Barneby admits that the distinction is not always very clear and that quite a few Rocky Mountain sheets must be identified with due regard to their place of collection. We are not very happy with varieties for which the place of origin tends to become a taxonomic character.

We consider that an individualized distribution is normally a resulting characteristic of a sound taxon at the level of variety or above. It results from the taxon having enjoyed an independent history on a geological time scale. A population having become isolated by genetic or geographical or other barriers, it will pursue an independent evolution until it may become phenotypically recognizable. Simultaneously the range of this taxon will also evolve independently, now expanding here, now retreating there, until it offers a pattern unlikely to be duplicated by any of its close relatives.

However an individualized distribution and a place of origin are not taxonomic characters per se. Any taxon in which the place of origin plays too large a role in identification is likely to prove to be of little taxonomic value, if not purely arbitrary.

19. A. eucosmus Rob. var. eucosmus (Atelephragma elegans

(Hooker) Rydb. -- Ovoid pods drooping, black-pubescent. Somewhat similar to the preceding. Tufted, 3-5 dm high. Leaves mostly with 13-15 leaflets. Inflorescence black-pubescent. Flowers 6-7 mm long, purplish. Legume 7-10 mm long, not sulcate, slightly falcate, sessile and usually rupturing the calyx at maturity. Late June. River gravels and sands on shores and bluffs. -- F-Aka, L-NF, MB-BC, US -- F. leucocarpus Lepage -- Pods and calyces with the pubescence entirely white. -- (Aka, Q)-O, S-BC.

The more eastern var. Fernaldii (Rydb.) stat. n., Atelophragma Fernaldii Rydb., Bull. Torr. Bot. Club 55:126. 1928; Astragalus Fernaldii (Rydb.) H.F. Lewis, Can. Field-Nat. 46:36. 1932, differs by its slightly larger and short stipitate legume, the stipe 1-3 mm long, the body of the legume 10-15 mm long. This variety is fairly neatly intermediate to A. Robbinsii.

In such a case of intermediate variety, it seems generally preferable to attach it to the species of coincident range. Because the intermediate type is much more likely to be derived from the species near at hand than from the more remote one. Further, any problem of distinctiveness and identification is much more likely to involve the near at hand species rather than the remote one.

20. A. aboriginum Rich. var. aboriginum (A. aboriginorum sphalmate; Atelophragma aboriginorum (Rich.) Rydb.) -- Long-stipitate, semi-lanceolate legume. Tufted, 2-4 dm high. Stem densely and finely hirsute, the hairs spreading. Leaves mostly with 9-11 leaflets, these 1-3 cm long, elliptic-lanceolate to linear-lanceolate, hirsute on both faces. Inflorescence at first dense, somewhat elongating. Flowers 7-10 mm long, creamy white to purplish on the keel and standard, drying bluish. Legume strongly flattened, straight to falcate, often slightly sulcate dorsally, the body glabrous to white-pubescent, 1.5-2.2 mm long, the stipe about twice as long as the calyx. Late spring. Open, sandy or gravelly places. -- sMack-Aka, seQ, Man-BC, US -- Var. major Gray (var. glabriusculus (Hooker) Rydb.; A. linearis (Rydb.) Pors.) -- Less densely pubescent to nearly glabrous, the pubescence appressed. -- Y-Aka, wQ, swMan-BC, US.

This is a much subdivided species. None of the proposed segregates seems to present sufficient morphological discontinuity to warrant specific rank. The better defined phenotypes may be recognized as varieties as follows.

- a. Stem hirsute.
 - b. Flowers 6-10 mm long var. aboriginum
 - bb. Larger, 10-15 mm long, and more deeply coloured, mostly pink to purplish, usually turning bluish in drying var. Richardsonii
- aa. Pubescence strigose and usually less abundant.
 - c. Flowers 6-10 mm long var. major
 - cc. Larger, 10-14 mm long var. Lepagei

Var. Lepagei (Hultén) stat. n., A. Lepagei Hultén, Fl. Aka. Yuk, 10:1761. 1950. Known from northern Mackenzie district and

Umiat in Alaska.

Var. Richardsonii (Sheldon) stat. n.; A. Richardsonii Sheldon, Bull. Geol. Nat. Hist. Surv. Minn. 9:126. 1894. Known from the western parts of the Arctic Archipelago and the northern reaches of Mackenzie district.

21. A. Robbinsii (Cokes) Gray (A. Macounii Rydb.; A. occidentalis (Watson) M.E. Jones) -- The narrowly ellipsoid pods black-pubescent and descendent. Stems 2-6 dm high. Leaves with 9-13 leaflets, these elliptic to lanceolate. Flowering racemes dense, elongating in fruit, becoming secund. Flowers 9-12 cm long, mauve or pale blue. Legume 1.0-1.5 cm long, stipitate, mid spring to early summer. Rivers shores and banks. -- (Mack-Y)-Aka, (NS), Alta-BC, US.

Varies in a manner reminiscent of A. aboriginum except that the various phenotypes do not seem to be restricted geographically.

22. A. Drummondii Douglas (Tium Drummondii (Douglas) Rydb.) -- The whole, and especially the stem, stiffly hirsute, the hairs very long. Stems 4-6 dm high. Flowers pale yellow, at first spreading, then pendent. Legume glabrous, pale green, drooping, cylindrical, dorsally sulcate, long stipitate. The body of the fruit is 1.5-2.5 cm long. Late spring to mid summer. Growing as scattered clumps in the Fescue prairies. -- S-Alta, US.

23. A. racemosus Pursh -- Pod triangular, flattened into 3 wings. Otherwise quite similar to A. canadensis and easily confused with it when in flower. Flowers bigger, 15-18 mm long, creamy white, spreading to drooping. Legume spreading to drooping, glabrous, sulcate dorsally and concave on both sides. Body of the pod about 2 cm long. Stipe very long. Late spring and early summer. Dry or eroded hillsides, tolerant of selenium; from Craven and Moose Jaw to the Dirt Hills. -- scS, US.

Mentioned for Alberta by Jones 1923 and Gleason 1952. There is no Alberta specimen in any Canadian herbaria, nor at NY, nor (fide Barneby in litt.) at PCM where M.E. Jones' herbarium is now preserved. This mention of Alberta was possibly based on a misinterpretation of the original report by Macoun 1883 for the Moose Jaw region.

24. A. FALCATUS Lam. -- Habitally similar to A. canadensis, but in its fruit more like A. alpinus, although much longer. Stems (4)-10-(15) dm high. Hairs strigose and partly malpighiaceus, black in the inflorescence. Flowers 1 cm or a little longer, pendent, whitish yellow with a purple tinge on keel and edge of standard. Legumes 2.0-2.5 cm long, pendent, strongly falcate, deeply sulcate dorsally, black strigose. Early summer. Rarely spreading or persisting from experimental plantings: Brandon. -- sMan, (nwUS, Eur).

25. A. canadensis L. var canadensis -- The fruiting raceme very dense and of stiffly erect pods. Stems 1 mm high or less, erect, solitary or in small tufts. Peduncle usually much shorter than the subtending leaf. Flowers 11-15 mm long, at first slightly ascending, then slightly descending, these collected in bud

usually developing a large brown spot in drying. Legume about 1.5 cm long, short-cylindric, sessile, glabrous. First half of summer. Moist open places. -- Mack, Q-BC, US.

Not to be confused with the habitually similar Glycyrrhiza. The latter has larger, acute and punctate leaflets.

West of us var. canadensis gives way to var. Mortonii (Nutt.) Watson with the ovary and fruit densely strigose.

26. A. CICER L. -- (Chiche de montagne) -- The inflated pods heavily black-hirsute at maturity. Stoloniferous, the stems 4-6 dm high, solitary. Leaflets strigose on both faces. Inflorescence dense, black-strigose. Flowers yellow. Legumes 1.0-1.5 dm long, ovoid to globular, maturing black, thin-walled. Early to mid summer. Rare weed of field crops; Brandon, Stavelly. -- Man, Alta, Eur.

27. A. adsurgens Pallas var. robustior Hooker (A. striatus Nutt.) -- Legume small, \pm 7 mm long, white-strigose. Tufted with a thick tap root. Stems numerous, 2-4 dm high, \pm decumbent at base. Leaflets mucronulate. Axillary racemes very compact, almost like a Trifolium, elongating slightly in fruit. Flowers 11-16 mm long, purplish, drying blue. Legume bilocular, sulcate. Early to mid-summer. Steppes and hillsides. -- Mack-(Y), O-BC, US--F. Chandonnetii (Lunell) Boivin -- Flowers white or cream. -- Man-Alta, US.

Another type from Yukon and Alaska has short-stipitate fruits: var. tananaicus (Hultén) Barneby. The typical phase is siberian; its inflorescence is not quite so dense and the calyx is slightly shorter.

F. Chandonnetii (Lunell) stat. n., A. Chandonnetii Lunell, Am. Midl. Nat. 2:127. 1911.

28. A. danicus Retz. var. dasyglottis (Fisher) Boivin (A. agrestis Douglas; A. goniatus Nutt.; A. hypoglottis AA.) -- Generally similar to the preceding, but smaller and long stoloniferous. Stolons and stems thin. Leaflets \pm retuse at tip. Inflorescence dense, black-pubescent. Flowers 14-20 mm long, mauve to blue, drying blue, legume densely velvety with long white hairs. Mid-spring to early summer. Prairies. -- Mack-Y, NO-BC, US, Eur -- F. virgultulus (Sheldon) Boivin -- Flowers white. Local -- Mack, Man-Alta, (US).

Var. dasyglottis (Fischer) stat. n., A. dasyglottis Fischer ex DC., Prodr. 2: 282. 1825, nec. A. dasyglottis Pallas 1800; A. hypoglottis L. var. dasyglottis (Fischer) Led., Fl. Alt. 3:293. 1831.

There has been a fair amount of tergiversation about the correct name of this entity and about the distinctiveness of the american plant from the eurasian A. hypoglottis, A. danicus and A. dasyglottis.

We cannot detect any difference between the american A. agrestis and the siberian A. dasyglottis. The resemblance of A. agrestis to A. hypoglottis L. is superficial only; the latter is pilose (agrestis is strigose) with longer hairs, the bracts are longer and muricate-ciliate, the leaflets are stubbier, the fruits are sharply triangular and at maturity the outer angles are

much flattened and almost wing-like. The distinctiveness from A. hypoglottis is ample enough to justify specific rank.

But the difference between A. dasyglottis and A. danicus is much more tenuous. There is no morphological discontinuity, only a series of tendencies, and barely marked enough at that to justify varietal rank. In var. danicus the pubescence is generally somewhat looser, the calyx bears more appressed pubescence and its tube and lobes are generally a bit shorter, the fruit averages shorter. Hence the classification adopted here which is intended to reflect the taxonomic situation.

Var. dasyglottis (Fischer) Boivin f. virgultulus (Sheldon) stat. n., A. virgultulus Sheldon, Minn. Bot. Stud. 1: 165. 1894.

29. A. crassicaulus Nutt. (var. Paysonii (Kelso) Barneby, var. trichocalyx (Nutt.) Barneby; A. caryocarpus Ker; A. mexicanus A.DC.; A. succulentus Rich.; Geoprummon crassicaulus (Nutt.) Rydb.; G. succulentus (Rich.) Rydb.) -- Buffalo-Bean, Buffalo-Berry (Graines de boeuf) -- The large heavy pods resting on the ground. Stems numerous, tufted, only 1-2 dm long at anthesis, elongating to 4-(7) dm and rather decumbent in fruit. Leaflets slightly fleshy. Inflorescence dense. Flowers large, 15-25 mm long, at first cream to mauve-blue, fading mauve-blue, drying blue at least in part. Legume 1-2 cm long, bilocular, indehiscent, hard, subglobular to ellipsoid, thick walled, at first somewhat fleshy, becoming heavily wrinkled and more or less woody, glabrous, red above, green below. Mid to late spring. Steppes and hillsides. -- Man-Alta, US.

Varieties based on flower colour and pubescence of calyx do not seem to be geographically segregated in our area. If anything, the flower colour is partly related to the time of collecting, the colour darkening before the corolla fades, but even as the flowers open some plants are of a much darker colour than others.

A more southern species, A. gracilis Nutt., has been reported by Barneby 1964 from between Prince Albert and Rosthern. A rather unlikely range extension which requires confirmation.

13. OXYTROPIS DC.

Technically different from Astragalus by the legume having a false partition arising from the ventral suture. In Astragalus there is no such partition or, if there is one, it arises from the dorsal suture. In practice Astragalus is normally caulescent, while Oxytropis is nearly always stemless and the leaflets are asymmetrical at the base.

- a. Leaflets mostly fascicled in 2's or more, appearing subverticillate.
 - b. Inflorescence \pm capitate, with few flowers 9. O. arctica
 - bb. Flowers numerous in an elongate, \pm lanceolate inflorescence 10. O. splendens
- aa. Leaflets alternate to subopposite.
 - c. Inflorescence reduced to (1)-2-(3)

- flowers 2. O. podocarpa
 cc. Flowers more numerous.
 d. Glandular-verrucose, especially so on
 the calyx lobes 5. O. leucantha
 dd. Not glandular-verrucose.
 e. Corolla 4-11 mm long; legumes
 pendent 1. O. deflexa
 ee. Corolla obviously longer; legume
 erect to spreading.
 f. Flowers yellow or cream.
 g. Flowers about 2 cm long;
 leaflets 9-15 7. O. sericea
 gg. Flowers smaller, mostly
 around 1.5 cm long; leaflets
 usually more numerous .. 6. O. campestris
 ff. Flowers purple.
 h. Calyx long spreading villous.
 i. Legume included in the
 calyx 4. O. Besseyi
 ii. Long-exserted; leaves
 much shorter 3. O. Lagopus
 hh. Calyx appressed-pubescent.
 j. Flowers mostly around
 2 cm long; hairs mal-
 pighiaceous 8. O. Lambertii
 jj. Flowers smaller; hairs
 basifixed 6. O. campestris

1. O. deflexa (Pallas) DC. var. sericea T. & G. (var. deflexa AA.; var. foliolosa (Hooker) Barneby; O. foliolosa Hooker)
 -- The stem usually short but clearly developed, the plant commonly 2-4 dm high. Abundantly long-villous. Leaflets mostly 25-45, the largest 1-2 cm long. Inflorescence at first ovoid, elongating while flowering, up to 1 dm long in fruit. Flower 6-11 mm, mauve to bluish, drying deep blue. Legume 13-19 mm long. First half of summer. Around bluffs and near watercourses. -- Man-BC, US -- Var. parviflora Boivin -- Similar, but the flowers smaller, 4-5 mm long, mauve to cream, often drying livid. Calyx tube around 2 mm long. Legume mostly 10-14 mm long. Early summer. -- Mack-Y-(Aka), Alta-BC -- Var. capitata Boivin (var. foliolosa AA.; O. foliolosa AA.) -- Nearly always stemless and less than 2 dm high. Inflorescence globular or nearly so, not elongating in fruit. Calyx tube 2.5-3.0 mm. First half of summer. Shore gravels, cliffs and alpine screes. -- (F), Mack-Aka, NF, Q-nO, swAlta-nBC, US.

2. O. podocarpa Gray var. inflata (Hooker) Boivin -- Very large bladdery pods. Low, densely tufted, the scapes up to 6 cm high. Leaflets densely strigose. Stipules long-ciliate, not glandular. Raceme reduced to (1)-2-(3) flowers. Flowers blue, 15-18 mm long. Legume ovoid, short-stipitate, long-acuminate, the body 1.5-2.5 cm long, strigose. First half of summer. High alpine shale slides. -- (swMack), Alta-BC, WUS.

Often confused with typical var. podocarpa from the eastern arctic. The latter has a blackish-looking calyx because of the more abundant and longer black hairs, mostly 0.5-1.0 mm long; the white hairs absent or few, if present mostly 1.0-1.5 mm long and about 1 1/2 times as long as the black ones. In our var. inflata the black hairs are shorter and are long overtopped by the more abundant white hairs, the latter mostly 1.0-2.0 mm long and mostly 2-4 times longer than the black ones. Further, var. inflata shows more or less definite tendencies to laxer growth, longer leaves, longer and more numerous leaflets, longer scapes and bigger fruits.

3. O. Lagopus Nutt. var. conjungens Barneby -- Fruit similar to the next, the calyx enlarging at maturity and not splitting, falling off with the legume, but the latter partly exerted and bigger, about twice as long as the calyx. In small and grayish-white tufts, the herbaceous being densely long villous. Leaves short, less than 5 cm long and bearing only 5-9 leaflets. Flowers like the next on a scape about 2-3 times taller than the foliage. Early spring. Rolling steppe on gravelly soil at Cardston. -- swAlta, nwUS.

The more southern var. Lagopus has a longer leaf bearing more numerous leaflets borne on a longer rachis, at least twice as long as the leaflets.

4. O. Begseyi (Rydb.) Blank. var. Begseyi -- Rather similar to a small O. Lambertii, but the pubescence not malpighiaceous and in part long spreading-villous, especially so on the calyces. Main leaves commonly 1 dm long and bearing (11)-15-(19) leaflets. Inflorescence overtopping the foliage but the scapes less than twice taller. Flowers about 2 cm long, bright magenta, spreading. Legume small, included in the calyx and soon falling off with it. Early summer. Rolling steppes, rare: Canopus, Val-Marie. -- swS, US.

The Alberta report by Boivin 1966 was based on a collection by Dawson incorrectly labelled Alberta. It came from along the Missouri River in Montana (CAN; DAO, photo).

Other varieties are all more southern and differ by shorter or fewer leaves, by a more compact inflorescence, etc.

5. O. leucantha (Pallas) Pers. var. depressa (Rydb.) Boivin. (O. viscida AM.; O. viscidula (Rydb.) Tid.) -- Glandular-verrucose throughout and especially densely so on the lobes of the calyx and on the ovary. Also more or less strigose, except on the ovaries and the calyx lobes. About 8-15 cm high. Leaflets 4-10 mm long. Calyx tube 4.0-5.5 mm. Flowers 12-13 mm long, maculate to purple. Fruit 13-15 mm long. Mid spring to early summer. Steppes. -- swAlta-(seBC), US -- Var. magnifica Boivin -- Generally larger. About 15-25 cm high; leaflets (5)-8-12-(11) mm long. Calyx tube 5-6 mm long. Flowers 13-17 mm long, purple. Legume 18-20 mm long. -- swAlta-neBC.

When O. leucantha 1800 and O. viscida Nutt. 1836 are subordinated as varieties of the same species, O. leucantha takes precedence because it is the earlier name.

6. O. campestris (L.) DC. var. gracilis (Nelson) Barneby (O. albertina (Greene) Rydb.; O. plabrata AM.; O. gracilis (Nelson) Barneby).

son) K. Schum.; O. Macounii Greene; O. villosa (Rydb.) K. Schum.) -- In large dense tufts. Stipules densely silky and ciliate with long hairs. Strigose throughout, the scapes 1.5-4.0 dm high. Leaves in two sizes, the short ones about half as long as the more numerous long ones. Leaflets numerous, mostly 19-33 per leaf. Flowers 12-18 mm long, white or cream. Early to mid summer. Very common in prairies. -- Man-BC, US -- Var. varians (Rydb.) Barneby -- Similar to var. gracilis, but the stipules ciliate with long hairs mixed with short glandular ones. Flowers yellowish. More northern. -- (F), Mack-Aka, nMan, nwBC -- Var. Cusickii (Greenman) Barneby -- Smaller than var. gracilis, about 0.5-1.5 dm high. Leaflets fewer, mostly 11-17. Inflorescence shorter and more compact. Alpine prairies. -- swAlta-seBC, wUS -- Var. dispar (Nelson) Barneby -- Flowers more or less mauve to purplish, drying bluish. Otherwise as var. gracilis, the foliage dimorphic. Sporadic mainly in the eastern prairies. -- Mack, sMan-Alta. (ncUS) -- Var. johannensis Fern. (O. johannensis Fern.; O. terrae-novae Fern.) -- Flowers purple, drying blue. Leaves mostly of about the same length. Scapes variable, mostly short. Churchill. -- (F), L-NF, (NS, NB)-Q-nO-nMan, (ne US).

Our varieties belong to ssp. gracilis (Nelson) Boivin in which the legume typically lacks a septum while the eurasian ssp. campestris comprises varieties with a weakly developed septum. Both subspecies are highly variable and may be subdivided into a series of weak varieties that are not always easy to define.

7. O. sericea Nutt. var. spicata (Hooker) Barneby (O. spicata (Hooker) Standley) -- Often confused with either the following or the preceeding. Flowers large, about 2 cm long and leaflets few, mostly 9-15, as in O. Lambertii. But the flowers yellowish and the pubescence not malpighiaceus, like O. campestris. Calyx lobes strongly contrasted from the tube by their heavy, black pubescence. Starts flowering around mid-spring and is in fruit by the time O. campestris is flowering. Prairies. --Y, (soMan)-S-BC, US.

Our var. spicata has yellow flowers in an inflorescence usually 5 cm long or less. South of the border it grades into a more southern var. sericea with a white flower mauve-tinged on the keel, and an inflorescence elongating to ± 1 dm in fruit.

The range was extended to southern Mackenzie District by Raup 1947 on the basis of two fragmentary collections by Crickmay along the Liard River (CAN: DAO, photo). While it would be difficult to achieve positive identification of these fragments, it would seem equally difficult to justify their identification to O. spicata; the flowers are rather large, but not large enough for O. spicata and the lobes of the calyx are devoid of the black pubescence so characteristic of the latter. We have tentatively revised both collections to the more likely O. campestris var. varians.

8. O. Lambertii Pursh var. Lambertii -- Locoweed, Loco -- Pubescence obscurely malpighiaceus, the lower arm of the hair being very short. Pubescence also partly strigose and more or

less sericeous. Mostly 2-4 dm high. Leaves with only (9)-15-(19) leaflets, these rather narrow and \pm linear. Inflorescence lax. Flowers bright and showy, about 2 cm long, purplish, usually drying very dark blue. Calyx lobes heavily white-villous, hence paler than the tube. Late spring to early summer. Prairies. -- sMan-seS, US.

Macoun and other earlier authors have used this name to cover more than one species, hence earlier reports are unreliable. Most older collections still filed under that name have now been revised to other species, mostly to O. campestris (L.) DC.

Two other varieties occupy the southern part of the range of the species: a var. Bigelovii Gray with broader leaflets, mostly lanceolate, and an often stipitate legume, and a var. articulata (Greene) Barneby with a somewhat longer calyx nearly enclosing a somewhat shorter legume, the latter not exerted except for the attenuate tip.

9. O. arctica Br. var. Bellii (Britton) Boivin (O. Bellii (Britton) Palibine) -- Some of the leaflets geminate and appearing subverticillate with 3-4 leaflets per verticil. Tufted, villous and small, about 1 dm high. Leaflets less than 1 cm long, 17-35 per leaf. Flowers few, mostly 4-6, closely aggregated at the summit of the scape. Flowers purple, about 2 cm long, more or less spreading. Legume densely black villous. Early spring to mid summer. Arctic gravels. -- F-K, nMan.

In the more widespread and generally more western var. arctica, the less numerous leaflets are alternate or opposite and only 11-19 per leaf.

10. O. splendens Douglas var. splendens -- Locoweed -- A very showy species, very densely long villous, the leaflets mostly subverticillate by 3-6 and the flowers deep pink. Densely tufted, 2-4 dm high. Grayish-villous, sometimes whitish-villous, less often with yellowish pubescence. Inflorescence dense. Flowers drying blue. Mid summer. Chernozems around bluffs and on top of hills. -- Mack-Y-(Aka), O-eBC, US -- Var. Richardsonii Hooker (O. Richardsonii (Hooker) K. Schum.) -- Much less densely villous and green. Semi-open places. May be only an ecological form. -- (Mack), nwO, cS-wBC.

14. GLYCYRRHIZA L.

LICORICE

Legume densely covered with hooked prickles. Otherwise much as in Astragalus.

1. G. lepidota Pursh var. lepidota -- Licorice, Wild Licorice -- Leaflets densely and finely punctate above in purple-black, but below only punctate with yellow glands. Erect herb about 1 m high, long stoloniferous and forming large colonies. Glandular throughout, the glandulosity sessile except on the calyces. Leaflets mostly lanceolate, entire, puberulent along the margin and the mid-nerve only. Legume 1-2 cm long, cylindric, \pm brown, indehiscent, very catchy. Early to mid-summer. Open places, mostly river banks. -- O-seBC, US -- Var. glutinosa (Nutt.) Watson -- Glands stipitate not only on the calyx, but, also at

least on the peduncle of the inflorescence. Rare. -- swAlta-(BC), US.

15. CORONILLA L.

Flowers in globose umbels as in Lotus or Trifolium, but the legume moniliform and at maturity breaking up into segments as in Hedysarum. However the legume is not flattened.

1. C. VARIA L. -- Crown-Vetch (Faucille) -- Flowers in a small globose umbel, but the leaves pinnate. Leaflets oblong-ob lanceolate. Leaves nearly sessile, the lowest pair of leaflets subbasal. Flowers rose with the protruding keel tips conspicuously purplish. Legume moniliform and falcate. First half of summer. Cultivated and rarely spreading: Brandon. -- Q-Man, US, Eur, (Afr).

16. HEDYSARUM L.

Like Astragalus, but with a fruit which readily breaks up into flat indehiscent articles. Keel truncate at tip, longer than the standard. Leaflets minutely black-punctate above. Legume more or less narrowed towards the articulations.

a. Flowers yellow 1. H. sulphurescens
aa. Flowers pink to purple.

b. Calyx lobes much shorter than the tube

2. H. alpinum
bb. Lobes longer than the tube 3. H. boreale

1. H. sulphurescens Rydb. -- Flowers yellow or cream. Calyx lobes slightly narrower and a bit longer, mostly 1.5-2.0 mm long, otherwise almost identical with H. alpinum. Late spring to mid summer. Open slopes. -- swAlta-seBC, wUS.

2. H. alpinum L. (var. americanum Mx., var. grandiflorum Rollins, var. philoscia (Nelson) Rollins; H. americanum (Mx.) Britton) -- Tufted erect perennial, 2-8 dm high. Flowers in elongate, more or less secund racemes. Calyx lobes (0.8)-1.0-(1.5) mm long, deltoid to triangular, shorter than the calyx tube. Corolla pink to carmine. First half of summer. Rich prairies, especially around Aspen groves. -- (F)-K-(Mack)-Y-(Aka, L)-NF, NB-BC, (US, Eur) -- F. albiflorum (Standley) Fern. -- Flowers white. Local: Cypress Hills -- (Aka), Q, S.

The american phase is usually separated varietally or specifically from the typical eurasian plant, however we have failed to detect a tangible and constant difference other than geography.

3. H. boreale Nutt. var. boreale (H. Mackenzii Rich. var. Fraseri Boivin) -- Erect to decumbent, 2-5 dm high. Strigose throughout except on the glabrous upper face of the leaflets. Calyx lobes 3-4 mm long, lance-subulate, all similar and nearly twice as long as the tube. Raceme elongate, not secund. Flowers 12-16 mm long, magenta to purple. Late spring to early summer. Hills and river valleys. -- wcS-Alta-(BC, US) -- Var. cinerascens (Rydb.) Rollins (H. cinerascens Rydb.) -- Leaflets

pubescent above. Dry hills and steppes. -- S-Alta, US -- F. album Boivin-Like the preceding but with white flowers. Local: Eastend. -- S -- Var. Mackenzii (Rich.) C.L. Hitchc. (M. Mackenzii Rich.) -- Inflorescence short and more compact. Flowers larger, 13-21 mm long and purple coloured. Prairies, especially in river valleys. -- F-(K-Aka, NF), Q-(O)-Man-BC, (Eur) -- F. niveum Boivin -- Flowers white. Local: Churchill -- F, Mack-Y, Man.

17. DESMODIUM Desv.

TICK-TREFOIL

Fruit very catchy, being covered with small hooked hairs. Otherwise much as in Hedysarum, the legume flat, indehiscent, constricted successively into a moniliform series of articles. The indehiscent articles separating readily at maturity. Leaves divided ternately rather than pinnately as in Hedysarum.

1. D. canadense (L.) DC. -- Beggar's Lice -- Erect perennial, mostly about 1 m high. Leaves trifoliate, the leaflets 3-8 cm long, ovate to lanceolate. Inflorescence a single terminal raceme or a panicle of racemes. Flowers purplish. Legume slightly falcate, stipitate, more deeply constricted on the dorsal than on the ventral side. Mid summer. Wetter, open spots. -- (NS), NB-sMan, US.

18. CICER L.

Leaves pinnate and serrate. A genus of herbs similar to Vicia and Lathyrus, but with the tendrils vestigial. However, our only species lacks any trace of tendrils and the leaf ends in a normal leaflet.

1. C. ARIETENUM L. -- Chick-Pea (Pois chiche) -- Erect annual herb 3-6 dm high, glandular-pubescent. Leaflets 1.0-1.5 cm long, elliptic to obovate, serrate and mucronate. Flower axillary, solitary. Calyx rather large, overtopping the whitish corolla. Peduncle strongly geniculate. Pod 1.5-2.0 cm long, ovoid, much inflated. All summer. Sometimes cultivated and appears to reseed itself at times, but not persistent. -- O-S, (BC), Eur.

19. VICIA L.

VETCH

Generally similar to Astragalus, but the terminal leaflet(s) replaced by 1-3 tendrils. Wings adnate to the keel. Style bearded at apex only. Legume dehiscent along both sutures, thus forming 2 valves.

a. Raceme with 1-7 flowers.

b. Inflorescence sessile or nearly so 1. V. sativa

bb. Peduncle of the inflorescence longer

than the lowest flower 4. V. americana

aa. Flowers much more numerous and mostly smaller.

c. Calyx tube longer than the lobes 2. V. Cracca

cc. Shorter than the lower lobes 3. V. villosa

1. *V. SATIVA* L. var. *ANGUSTIFOLIA* (Reichard) Wahl. (*V. angustifolia* Reichard) -- Vetch (*Pois sauvage*) -- Flowers (and fruits) mostly 2 on a rachis, the latter less than 1 cm long. Flowers 12-18 mm long. Calyx lobes 3-6 mm long, subequal. Late spring to mid summer. Rare weed: Otterburne. -- (G), Aka, NF-SPM, NS-Man, US, Eur.

An earlier report from Fort Garry was based on a depauperate specimen of *V. americana*.

Var. *sativa* has larger leaflets and flowers, the leaflets mostly 5 mm wide or more, the flowers 20-(30) mm long. Not yet known from our area, but probably as likely to occur as var. *angustifolia*.

2. *V. CRACCA* L. (var. *tenuifolia* (Roth) G. Beck) -- Bird-Vetch, Tufted Vetch (*Jargeau*, *Petits oiseaux*) -- Perennial, mostly 1 m long or more, glabrous or appressed pubescent. Leaflets 13-21, linear to lanceolate. Racemes dense, secund. Flowers blue, 9-13 mm long. Calyx-lobes up to 2.0 mm long. Legume flat, straight, stipitate. All summer. Cultivated and rarely escaped to roadsides, etc. -- (G), K, Y-Aka, L-NF-(SPM), NS-BC, US, Eur.

Despite reports to the contrary, not obviously native in our area, or in any other part of North America. A number of varieties are sometimes recognized; none is clearly significant in the American part of the range.

3. *V. VILLOSA* Roth (*V. Cracca* L. var. *multiflora* (Poll.) Gaudin) -- Much like the preceeding, but the calyx seemingly attached dorsally because of a strong gibbosity on the ventral side. Reputedly annual or biennial. More or less villous throughout. Flowers purplish, 11-18 mm long. Calyx-lobes 3.5-5.0 mm long on the dorsal side, those of the ventral side much shorter. Summer. Cultivated and casual in fields and roadsides: Brandon. -- (Aka), NS, Q-Man, BC, US, Eur.

4. *V. americana* Muhl. var. *americana* (*V. angustifolia* AA.) -- Pea-Vine, Buffalo-Pea -- Perennial, 2-8 dm high, glabrous to puberulent. Leaflets 7-13, ovate to narrowly lanceolate, entire, broadly acute to truncate at summit. Flowers 15-22 mm long, purple, fading blue. Mid spring to early summer. Bushes or margins of Aspen bluffs. -- Mack, (Aka), Q-BC, US -- Var. *truncata* (Nutt.) Brewer (*V. oregana* Nutt.) -- Leaflets of the upper leaves refuse to refuse-truncate at summit, often few-toothed on the shoulders. -- O-seS-(Alta)-BC, US -- Var. *minor* Hooker (var. *angustifolia* Nees; *V. sparsiflora* Nutt.; *V. trifida* Dietr.) -- Smaller and commonly 2-3 dm high. Leaflets smaller, linear-lanceolate to narrowly linear, mostly 2-3 mm wide. Prairies and steppes. -- Man-BC, US.

Vicia hirsuta (L.) S.F. Gray was mentioned from Olds by J.M. Macoun 1897 on the basis of a collection by T.N. Willing. In 1964 we failed to find such a collection under *Vicia* at CAN.

20. LATHYRUS L.

EVERLASTING PEA

Quite similar to *Vicia* from which it differs by its free wings and its style bearded along the upper side. More obviously different is the flower, straight in *Vicia*, sharply bent in ours.

- a. Leaflets 2.
 - b. Stem wingless 1. L. tuberosus
- bb. Stem with 2 obvious decurrent wings.
 - c. Leaflets long linear 2. L. sativus
 - cc. Broadly lanceolate to rhomboid-obovate 3. L. odoratus
- aa. Middle and upper leaves with 4 or more leaflets.
 - d. Raceme dense, with 15-25 flowers 6. L. venosus
 - dd. Raceme with only 2-12 flowers.
 - e. Leaflets lanceolate to linear 5. L. palustris
 - ee. Leaflets oblong to ovate.
 - f. Stipules cordate 4. L. japonicus
 - ff. Stipules semi-ovate 7. L. ochroleucus

1. L. TUBEROSUS L. -- Tuberous Vetchling -- The thin and wingless stem from a larger tuber. Leaflets 2, narrowly elliptic to oblanceolate, mostly 2-4 cm long. Flowers few, purple, about 1.5 cm long. All summer. Spreading from cultivation. -- Q-sMan, US, Eur.

2. L. SATIVUS L. -- Chickling Vetch (Lentille d'Espagne) -- Annual with solitary flowers. Stem winged. The 2 leaflets narrowly linear, 4-10 cm long. Flower white to pink or blue, about 1.5 cm long. All summer. Sometimes cultivated and rarely reseeding itself. Boharm. -- Q, S, (US), Eur, (Afr).

3. L. ODORATUS L. -- Sweet Pea (Pois de senteur) -- Flowers larger and mostly in 2's. Herbage somewhat hirsute, glandular and long ciliate. Flowers very showy 2.5-3.0 cm long, white or coloured, 1-3 and pendent at the end of a long peduncle recurved at tip. Legume long pilose. All summer. Cultivated ornamental sometimes reseeding itself in dumps or loose soil, but not long persistent: Brandon. -- O-Man, Eur.

4. L. japonicus W. (var. aleuticus (Greene) Fern., var. glaber (Ser.) Fern., var. pellitus Fern.; L. maritimus Big.) -- Beach-Pea, Indian-Pea (Pois de mer, Pois des dunes) -- Slightly fleshy seacoast herb. Stem wingless, up to 1 m high. Stipules cordate or hastate and at least half as large as the leaflets. Leaves with 4-10 mostly oblong leaflets. Mid summer. Shores: Hudson Bay, Lake Winnipeg. -- (G), K-Mack-(Y)-Aka, L-SPM, NS-Man, BC, US, Eur.

Quite a few phenotypes have received names; they seem to have essentially the same distribution, although one or the other may be dominant locally. While this species is essentially a maritime plant, it does also occur inland on the shores of a few large bodies of freshwater.

5. L. palustris L. (var. linearifolius Ser., var. macranthus (T.C. White) Fern., var. myrtifolius (Muhl.) Gray, var. pilosus (Cham.) Led.) -- Vetchling, Marsh-Pea (Pois de marais) -- More or less pubescent and 5-9 dm high. Upper leaves with 6-8 leaflets, these 3-6 cm long, lanceolate to linear. Stipules narrowly semi-sagittate. Racemes with 4-7 blue flowers. Early summer. Moist and wooded habitats. -- (K), Aka, (L-NF) - SPM,

NS-S, BC, US, Eur.

Quite variable, but the many described varieties do not seem to be in any way significant.

6. L. venosus Muhl. var. intonsus Butt. & St. John -- Cattle-Pea-Vine -- Pubescent and about 1 m high. Leaflets 10-12, elliptic, 2-6 cm long. Stipules semi-sagittate. Flowers numerous, violet. First half of summer. Moist places in and around woods. -- (Aka), Q-neBC, US.

In the more eastern var. venosus the herbage, including the calyces, is glabrous or nearly so.

7. L. ochroleucus Hooker -- Yellow Pea -- Flower two-toned, cream and pale orange. Glabrous and 4-8 dm high. Leaflets 4-8, ovate, 2-5 cm long. Stipules semi-ovate and coarsely toothed towards the base. Raceme with 5-11 flowers. Late spring and early summer. Moist places, mostly in Aspen groves. -- Mack, Q-BC, US.

21. PISUM L.

Differs from Vicia by its dilated calyx-lobes which are like leafy appendages.

1. P. SATIVUM L. -- Pea (Pois) -- Glaucous and glabrous annual mostly 1 m high. Leaflets 2-4, ovate to rhombic, 2-7 cm long, entire or dentate. Stipules semi-ovate to semi-elliptic, dentate, as large or larger than the leaflets. Flowers in 2's or solitary, 1.5-2.0 cm long, mostly white. Summer and fall. Cultivated in heavy soils and exceptionally reseeding itself: Saint-Pierre-Jolys. -- (G), Q-Man, BC, (Eur).

22. PHASEOLUS L.

BEAN

Like the following, a climber with trifoliate leaves, but the calyx 5-lobed and subtended by a pair of accessory bracts.

1. P. VULGARIS L. -- Bean, String-Bean (Fève, Fève à beurre) -- Twining stem retrorse-scabrous. Leaflets deltoid-ovate, the lower cordate. Calyx bracts broadly ovate. Legume mostly around 1 dm long. Mid summer. Cultivated and rarely subsontaneous: Grand Rapids. -- cMan, (US, CA, Eur).

23. AMPHICARPA Ell.

Climbing by its twining stem. Calyx with only 4 lobes and bractless except for the bract at the base of the pedicel.

1. A. bracteata (L.) Fern. var. bracteata (A. monoica Ell.) -- Hog-Peanut -- Stems thin, up to 1 m long, finely retrorse-pubescent, with a ring of longer, reflexed and stiff hairs at each node. Raceme few-flowered, on a long peduncle. Flowers whitish to pale mauve. Mid-summer. Galerie-forests. -- NS, NB-SMan, US.

In our variety the pubescence is pale or transparent and more or less appressed, especially on the leaflets; the legumes may be lightly strigose on both faces or merely antrorse-hirsute

at the edge. In the more southern var. comosa (L.) Fern., the pubescence is tawny, coarser, more abundant and hirsute; it is especially obvious on the stem, the petioles and at the margin of the leaflets. The pubescence of the legume becomes retrorse below the middle.

Order 9. SALICALES

Single family. This and the next two orders have flowers in catkins.

17. SALICACEAE (WILLOW-FAMILY)

Dioecious trees and shrubs. Mature carpels liberating many pappus bearing seeds. Leaves simple and alternate. The catkin is a raceme (or spike) of highly reduced flowers, each subtended by a bract. Calyx and corolla absent, each flower being reduced to its stamens or to its ovary.

- a. Buds covered by many overlapping scales 1. Populus
- aa. Buds covered by a single hood-shaped scale 2. Salix

1. POPULUS L. POPLAR

Stamens 5 or more per flower. Trees, often very large, mostly with large leaves. Leaves always simple and entire to coarsely toothed.

- a. Leaves lanceolate or narrower 5. P. angustifolia
- aa. Leaves ovate to round or deltoid.
 - b. Leaves round or ovate.
 - c. Leaves ovate, strongly discoloured..... 4. P. balsamifera
 - cc. Leaves roundish, barely paler beneath.
 - d. Finely crenate 1. P. tremuloides
 - dd. Coarsely toothed 2. P. grandidentata
- bb. Leaves broadly deltoid 3. P. deltoides

Various other hybrids, besides those mentioned below, are also known in our area, but are still under study.

1. P. tremuloides Mx. (var. aurea (Tid.) Daniels) -- Aspen, White Poplar (Tremble, Peuplier blanc) -- The leaves quaking even when there seems to be no breeze. Perhaps our most common tree, stoloniferous and forming numerous bluffs in the prairie. The bark pale grayish green to almost white. Leaves round, glabrous, crenulate, abruptly short-tipped, not resinous and slightly glaucous below. Petiole strongly flattened laterally. Very early spring. General, in depressions southward, in well drained situations northward. -- (k)-Mack-Aka, L-SM, NS-BC, US, (CA).

From the Red River and the Coteau de Prairie westward, this is supposed to give way to var. aurea, but no such transition is obvious in the field. In the herbarium no consistent difference

could be detected between the populations of eastern and western Canada and we came to the conclusion that the description of var. aurea was the description of a random specimen within the normal range of variation of the species. Other named varieties appear to be extremes of variation of no geographical significance.

2. P. grandidentata Mx. -- Poplar (Tremble) -- Very conspicuous in early spring when the foliage is entirely covered by a thick white tomentum. Otherwise much like the preceding. Leaves very coarsely toothed, soon glabrous. Very early spring. In better drained situations. -- NS-seMan, US.

3. P. deltoides Marsh. var. occidentalis Rydb. (P. Sargentii Dode; P. virginiana AA.) -- Cottonwood (Liard, Cotonnier) -- One of our larger trees, up to 20 m high, the trunk up to 1 m across, the bark deeply furrowed. Petioles flattened. Leaves broadly deltoid, coarsely serrate, long-acuminate, green on both faces. Bud scales ciliate, finely puberulent on back. Early spring. Sand hills and shores, usually sandy, of larger rivers. -- Man-Alta, US.

Populus Sargentii Dode is reputed to differ from P. deltoides by its pedicels shorter than the capsule, its puberulent bud scales and its coarser serration of fewer teeth. All our specimens, either eastern or western had short pedicels and we consider this difference to be of no account.

A sampling of Ontario and Quebec specimens contrasted with a sampling from Saskatchewan and Alberta showed that the difference in serration has a statistical value but is not a practical character to distinguish an eastern and a western population. On spring leaves the eastern specimens showed 10-27 teeth per side with the average around 15-20, while the western specimens had a much narrower range of 8-15 teeth per side. Leaves produced later in the season have gradually smaller and more numerous teeth with a maximum of 42 per side in the East and only 28 in the West. Another character worth noting, but hard to appreciate without a fair amount of comparison material on hand, is that in the East the serrations reach to the base of the acumen, while in the West they tend to stop may be 1 cm short of the base of the acumen.

The pubescence and ciliation of the bud scales is a more clear cut character. All our western specimens showed such pubescence, while it was present only in a few eastern ones (maybe 1 in 10). This character is however, of limited usefulness since about half of the specimens on hand were collected before mid summer and had not yet developed their winter buds.

In short, the characters of P. Sargentii show such a wide range of overlap that the taxon may best be treated as a variety of the eastern P. deltoides.

All specimens examined from our area proved to belong to var. occidentalis.

3 X. P. Bernardii Boivin -- Northwest Poplar -- A hybrid with P. tremuloides. Leaf broadly ovate to broadly cordate, not or little gummy, paler and slightly glaucous below. Serra-

tions well marked but not as coarse and much more abundant than in P. deltoides. Sporadic in sandhills, rare on river shores, but very common in cities and towns where it seems to be our most commonly planted tree. -- swQ-Alta, ncUS.

4. P. balsamifera L. var. balsamifera (var. Michauxii Dode) Henry, var. subcordata Hylander; P. Tacamahacca Miller) -- Black Poplar (Peuplier, Peuplier noir, Liard) -- Tree with strongly discolour leaves. Buds large and very resinous. Petiole terete. Leaves mostly ovate, varying from lanceolate on young shoots to cordate on old trees, minutely glandular-serrulate, minutely ciliate, glabrous to finely puberulent along the nerves, dark green above with a yellow mid-nerve, much paler below, whitish-green with a conspicuous reticulation, somewhat resinous and often developing, upon drying, large russet patches. Capsule finely rugulose. Styles and carpels 2. Early spring before the leaves. Shores and wetter places. -- sk-Aka, L-(NF-SPM), NS-(PEI)-NB-Alta-(BC), US -- F. candicans (Aiton) Boivin (P. candicans Aiton; P. gileadensis Rouleau) -- Leaves very finely puberulent below or on both faces and usually also cordate. Twigs and petioles also puberulent. Sporadic; sometimes planted. -- MF, NS, NB-O, S, US, (Eur) -- Var. californica Watson (P. trichocarpa T. & G., var. hastata (Dode) Henry) -- Capsule coarsely verrucose and/or of 3 carpels. -- (Y)-Aka, swAlta-BC, wUS, (CA).

Older trees tend to produce more deeply cordate leaves (= var. subcordata).

4 X. P. Dutillyi Lepage -- Hybrid with P. tremuloides. The leaves not so strongly discolor, not so gummy and perhaps a bit glaucous below. Buds smaller and less gummy. Petioles a little flattened. Leaf broadly ovate or broadly cordate to roundish, abruptly short-acuminate at tip, minutely ciliate. -- Q-Alta.

5. P. angustifolia James -- Yellow Cottonwood, Black Cottonwood (Liard amer) -- A small tree with \pm lanceolate leaves and paler yellowish twigs. Petioles terete and short, mostly about 1 cm long. Leaf yellowish green, somewhat paler below, glabrous, glandular-serrulate to the tip, the marginal glands very resinous and usually marking the paper in drying. Early spring with the leaves. Flood-plains of large rivers. -- swS-wAlta, wUS, (CA).

5 X. P. acuminata Rydb. -- Hybrid of P. deltoides. Leaves rhomboid to elongate-rhomboid, more coarsely serrate. Petioles somewhat longer and compressed. Leaf definitely acuminate but not as much as in P. deltoides and the acumen entire except at base. Serrations often gummy. Rather frequent wherever both parents occur as P. angustifolia seems to hybridize very freely with any other Poplar that may occur near by. Backcrosses are also frequent -- swAlta, wUS -- Mm. Andrewsii (Sarg.) Boivin -- A backcross to P. deltoides. Leaves thick and firm, broadly ovate-rhomboid, long acuminate, coarsely serrate right up to the base of the acumen. Local and less frequent. Sometimes used as a shade tree further south. -- swAlta, wUS.

5 X. P. Sennii Boivin -- Hybrid of P. tremuloides. Leaves

dimorphic, the earlier ovate, the later ones elliptic lanceolate. Twigs yellowish, becoming pale gray. Buds small and only slightly glutinous. Petioles variable, tending to be short and mostly under 2 cm long, not compressed. Leaves slightly paler and slightly glaucous below, finely serrulate at margin. Older leaves not gummy, the younger ones gummy in the manner of P. angustifolia. Rare: Lethbridge. -- swAlta.

2. SALIX L.

WILLOW

Stamens fewer, mostly 2, sometimes 3-5 per flower. Buds covered by a single hood-shaped scale. Small to large shrubs, sometimes trees.

The following key is based on pistillate specimens. In the field staminate specimens plants may be readily associated with the pistillate plants of the same species. Foliage specimens do not key out easily and are best identified by comparison. Once well learned, a species can usually be recognized by its foliage alone.

- a. Prostrate, or creeping alpine or arctic shrubs, 2 dm high or less Group 1
- aa. Taller, erect or ascending.
 - b. Carpels glabrous.
 - c. Catkin scales pale coloured, yellowish to pale brown, fugaceous Group 2
 - cc. Scales dark coloured, brown to black, remaining on the catkin to maturity Group 3
- bb. Carpels pubescent.
 - d. Catkin borne on the old wood, not leafy at base, sessile or on a short leafless peduncle Group 4
 - dd. Catkin at the end of a leafy new shoot Group 5

Group 1

Low, prostrate or creeping shrubs, alpine or arctic, the ascending shoots less than 2 dm high.

- a. Carpels glabrous.
 - b. Catkins subterminal, few-flowered, with less than 10 ovaries 9. S. herbacea
- bb. Catkin on lateral shoots and much more heavily flowered.
 - c. Catkin sessile, leafless at base 23. S. calcicola
 - cc. Catkin on a leafy peduncle (i.e. terminating a leafy short-shoot).
 - d. Leaves crenulate 21. S. myrtillofolia
 - dd. Leaves entire 10. S. arctophila

aa. Carpels pubescent.

- e. Leaves finely and shallowly crenate all around with a gland in each sinus.
 - f. Petioles at least one fourth as long as the blade 7. S. reticulata
 - ff. Petioles much shorter, less than twice as long as the corresponding bud 8. S. vestita
- ee. Leaves entire, not glandular-margined.
 - g. Catkins subterminal, that is borne on a normal size shoot and opposite the uppermost leaf, with the terminal bud in the middle. Very small shrubs 7. S. reticulata
 - gg. Catkins terminal on leafy peduncles or short lateral shoots bearing only a few leaves without axillary buds, or with only poorly developed ones.
 - h. Pistillate bracts light coloured, yellowish to light brown 12. S. glauca
 - hh. Pistillate bracts dark coloured, blackish throughout or at least in the upper half.
 - i. Capsule grayish to white-pubescent 11. S. arctica
 - ii. Capsule more thinly pubescent to glabrous, reddish, drying black 10. S. arctophila

Group 2

Carpels glabrous, subtended by a caducous pale coloured scale. Erect or ascending trees or shrubs, at least 2 dm high. Stamens 4-5 in the first 3 species, only 2 in the others.

- a. Petiole glandular above near the junction of the limb.
 - b. Capsules 4.5-7.0 mm long 2. S. lucida
 - bb. Capsules 7.0-10.0 mm long 3. S. serissima
- aa. Not so glandular.
 - c. Flowers and capsules clustered and subverticillate 1. S. amygdaloides
 - cc. Flowers and capsules spirally arranged.
 - d. Leaves remotely serrulate to entire.
 - e. Leaves remotely serrulate to nearly entire 6. S. fluviatilis
 - ee. Leaves entire 26. S. pedicellaris
 - dd. Broader and closely serrulate.
 - f. Branchlets brittle, the year's growth separating very readily from the main branch 4. S. fragilis
 - ff. Not brittle 5. S. alba

Group 3

Like group 2, but the scales dark coloured, at least at

the tip, brownish to black and persistent at least to the maturity of the catkin.

- a. Catkin sessile on old wood and quite leafless at base, or on a short peduncle bearing a few very small leaves barely longer than the capsules.
 - b. Twigs long spreading-villous 23. S. calcicola
 - bb. Twigs glabrous or somewhat pubescent when very young, by exception densely puberulent 16. S. monticola
- aa. Catkin terminating a lateral shoot bearing a few normal or reduced leaves.
 - c. Leaves entire, slightly revolute 26. S. pedicellaris
 - cc. Leaves glandular-serrulate.
 - d. The 2-or 3-year old twigs jet black.
 - e. Young leaves villous on both faces, green below 20. S. commutata
 - ee. Leaves glabrous and slightly glaucous below 19. S. Barclayi
 - dd. The 2-year old twigs paler, yellow to reddish or brown.
 - f. Twigs yellowish or straw coloured, the new ones sometimes purplish 17. S. lutea
 - ff. Twigs green, reddish or purplish to brownish, often drying blackish, the older ones turning gray.
 - g. Stipe slightly shorter to slightly longer than the scale 21. S. myrtillifolia
 - gg. Stipes much longer than the small scales.
 - h. Young shoots with strong balsam fragrance 15. S. pyrifolia
 - hh. Not odoriferous ... 18. S. mackenzieana

Group 4

Erect or ascending shrubs or small trees with pubescent ovaries and capsules. Catkins appearing before the leaves, sessile or nearly so, leafless at base and borne on old wood.

- a. Leaves glabrous or nearly so below.
 - b. Capsules 7-10 mm long on pedicels 1.0-2.5 mm long 27. S. discolor
 - bb. Capsules smaller, 5-6 mm long and subsessile 31. S. phyllicifolia
- aa. Leaves densely puberulent to white tomentose below.

- c. Leaves densely soft villous on both faces 24. S. Barrattiana
- cc. Glabrous to lightly floccose above.
 - d. Leaves rather narrow, more than four times longer than wide.
 - e. Twigs white-tomentose 25. S. alaxensis
 - ee. Twigs bluish to dark coloured 32. S. pellita
- dd. Leaves oblanceolate to obovate.
 - f. Capsule 2.5-4.0 mm long, white-silky at least when young 34. S. sitchensis
- ff. Capsule much longer.
 - g. Pubescence of lower surface of leaf entirely of white hairs 28. S. humilis
 - gg. Pubescence of new leaves partly russet coloured 27. S. discolor

Group 5

Similar to group 4, but flowering later, at the same time as the leaves, and the catkins borne at the end of a short leafy shoot.

- a. Pedicels well developed, as long as to many times longer than the scales.
 - b. Leaves narrowly lanceolate to linear 29. S. petiolaris
- bb. Leaves broader, ovate to oblanceolate.
 - c. Leaves of the sterile and fertile shoots of about the same size 26. S. pedicellaris
- cc. Leaves of the sterile shoots many times larger 22. S. Bebbiana
- aa. Pedicels shorter to nearly lacking.
 - d. Aments subterminal; stigma sessile 8. S. vestita
- dd. Aments terminal; style at least 0.5 mm long.
 - e. Leaves entire to shallowly and remotely crenate.
 - f. Leaves white-tomentose below, floccose above, remotely crenate 30. S. candida
 - ff. Leaves glabrous to sericeous, entire.
 - g. Leaves lanceolate to long-linear 6. S. fluviatilis
 - gg. Leaves broader, ovate to oblong-lanceolate.

- h. Petiole very short, 2 mm
long or less 13. S. brachycarpa
- hh. Petiole longer.
 - i. Capsule 2.5-3.5 mm
long 34. S. sitchensis
 - ii. Much larger, 4-8 mm
long.
 - j. Catkins at the
end of a leafy
shoot bearing
leaves at least
half as long as
the leaves of
sterile shoots 12. S. glauca
 - jj. Catkins subsessile,
bearing at base a
few bracts hardly
longer than the
capsules 31. S. phylicifolia
- ee. Leaves serrate.
 - k. Very remotely serrate 6. S. fluviatilis
 - kk. Closely serrate.
 - l. Leaves glaucous and sil-
ky to lightly strigose
below 33. S. arbusculoides
 - ll. Leaves glabrous on both
faces and slightly pal-
ler green below 14. S. MacCalliana

1. S. amygdaloides Andersson -- A fairly large native tree with yellowish-green foliage of long caudate and somewhat drooping leaves. Branchlets yellow. Stipules small and nearly always absent. Petioles slender, yellowish, glandless, rather long, mostly about 1 cm. Leaf lanceolate, glabrous except when very young, finely glandular serrulate, slightly paler and glaucous below. Earlier leaves not caudate, much smaller, entire, cuneate at base and nearly sessile. Catkins lax, terminating short leafy shoots. Stamens about 5. Capsule glabrous, + 4 mm long. Stipe glabrous, 1.0-1.5 mm long. Stigma subsessile. Scale about 2 mm long, white or nearly so, densely tomentose ventrally, at least partly glabrous on the back. Flowering in mid-spring with the leaves. River shores at the inner edge of the galerie-forest.--swQ-sBC, US.

2. S. lucida Muhl. (var. anustifolia Andersson, var. intonsa Fern.; S. candata (Nutt.) Heller, var. parvifolia C.R. Ball; S. lasiandra Bentham, var. caudata (Nutt.) Sudw., var. lancifolia (Andersson) Bebb) -- (Saule laurier) -- A small native tree with long-caudate shining leaves. Twigs yellow to brownish. Leaves dark green, thick, lanceolate, glabrous or nearly so, paler to strongly glaucous below. Mid-nerve pale yellow. Catkins stout, terminating short leafy shoots. Sta-

mens 4-(5). Capsules subverticillate, glabrous, 5-7 mm long. Stipe 1-2 mm long. Style not well defined, 1 mm long or less. Scale caducous, pale, mostly whitish, lightly pilose. Flowering after mid spring, shortly after the leaves. Along streams and lake shores.--Mack-Aka, L-SPM, NS-BC, US.

The western plants are commonly distinguished as S. lasiandra but there is no geographical discontinuity and we have been unable to detect a morphological one. However the phenotype with the leaves strongly glaucous below presents a statistical difference, being uncommon in the east but the most frequent type in the west. Var. caudata is commonly used for western specimens with leaves green on both faces.

3. S. serissima (Bailey) Fern. -- A colonial shrub with dark shining leaves and the last to flower and fruit, usually shedding its seed after mid summer. Similar to the preceding and long confused with it. Twigs shining and reddish brown. Leaves lanceolate, merely acute to subacuminate, firm, glandular-serrulate, dark green above, paler and usually more or less glaucous below. Mid-nerve pale yellow. Catkins terminating short leafy shoots. Stamens 5. Capsules subverticillate, glabrous and shining, 7-9 mm long. Stipe glabrous. Scales caducous, pale yellow, villous. Style less than 1 mm long. Late spring to early summer, after the leaves. Marshes and bogs.--(Mack, L-NF), Q-Alta, US.

4. S. FRAGILIS L. -- Crack Willow (Saule) -- A large introduced tree, rarely escaped, the new lateral shoots snapping off very readily at the point of origin in a strong breeze or when pressed backwards. Leaves about lanceolate, somewhat caudate, closely glandular-serrate, glabrous, glaucous below. Catkins long and narrow, terminating short leafy shoots. Stamens only 2 (like all the following species). Capsule small, glabrous, 3-5 mm long, short stipitate. Flowering in mid spring with the leaves. Planted and rarely escaped at Otterburne, Athabaska Landing, La Sale river and may be elsewhere.--NF, (NS-NB)-Q-SMan, (nAlta), US, Eur.

5. S. ALBA L. -- French Willow (Saule) -- Similar to the preceding. Branchlets not brittle. Leaves lightly silky or strigose, the hairs essentially parallel to the mid-nerve. Flowers in mid-spring with the leaves. Rarely escaped to river shores: Edmonton.--(NF, NS-NB)-Q-O, Alta, (US, Eur).

S. acutifolia W., S. alba L., var. argentea Wimmer, var. sericea Gaud, var. vitellina (L.) Stokes and S. pentandra L. were included in the Saskatchewan list by Breitung 1957. There is a gradual transition from cultivated to spontaneous or naturalized species and authors of floras vary greatly as to where they draw the line between the escaped plants to be included in a flora and the cultivated ones to be searched for in manuals on cultivated plants. We have included such as are obviously or apparently long persistent after cultivation, such as Rheum, or spreading from cultivation, such as Hesperis, or at least very readily reseeding itself, such as Lepidium sativum. Species

more contingent upon the immediate or continuous care of the cultivator have been omitted. The six Willows enumerated above are omitted as being a clear case of "planted" or "cultivated" ornamentals and windbreaks.

6. S. fluviatilis Nutt. var. fluviatilis (S. melanopsis Nutt., var. Bolanderiana (Rowlee) Schneider) -- Differs from the more widespread var. sericans by its wider leaves 3-8 times longer than wide, mostly 5-10 mm wide, sometimes glaucous below. Twigs mostly purplish and turning black upon drying. Capsule variable, mostly glabrous and 4-6 mm long. Mostly a shore species.--swAlta-seBC, US -- Var. sericans (Nees) Boivin (S. exigua Nutt.; S. interior Rowlee, f. Wheeleri (Rowlee) Rouleau, var. pedicellata (Andersson) C.R. Ball; S. longifolia Muhl.; S. melanopsis Nutt. var. tenerrima (Hend.) R.R. Ball -- Leaves narrowest. Sometimes a small tree, but commonly forming large dense colonies of flagelliform shoots 1-2 m high. Young shoots densely grayish-silky, soon becoming green and much less pubescent to glabrous. Leaves long linear 10-15 times longer than wide, mostly 5 mm wide or less, very remotely glandular-denticulate, or rarely entire, usually equally green on both faces. Catkins often in clusters of 2 or 3, terminating lateral shoots that carry normal-size leaves and often branch again to produce later catkins and carry the flowering into mid-summer. Scales yellowish, caducous. Ovary glabrous. Flowering with the leaves or a little later, from mid to late spring or sometimes up to mid summer. Wet places, but especially common on sandy shores. --Mack-Aka, NB-BC, US -- F. Hindsiana (Bentham) Boivin (S. interior Rowlee var. exterior Fern) -- Pubescence spreading, longer, denser, velvety, persistent all summer. Local --Mack, O, S-BC.

Travelling through the western U.S.A. in 1960, we found it impossible to recognize more than one species in the S. fluviatilis group. This confirmed our previous field experience in Canada and explained our troubles in the herbarium in trying to distinguish the 4 to 7 species that some authors recognize in this group. More heavily pubescent plants, such as S. sessilifolia Nutt. or S. Hindsiana Bentham are fairly frequent and will often appear to be genetically controlled or sometimes only ecologically conditioned; it seems doubtful if they deserve to rank taxonomically any higher than form.

Some specimens of var. sericans, from Saskatchewan or Manitoba, especially vigorous shoots, will on occasion exhibit larger leaves and may be found in various herbaria determined as S. fluviatilis or S. melanopsis, but do not seem to have ever been reported as such in the botanical literature.

7. S. reticulata L. -- Leaves conspicuously reticulate and deeply impressed above. Very depressed and mostly buried underground. Stoloniferous. Twigs reddish and glabrous. Leaves mostly 1-4 cm long, oboval to oblong, crenulate, dark green above, usually glabrous below and strongly whitish - glaucous with strongly contrasting reticulate nerves. Petiole elongate.

Catkins subterminal on a normal shoot. Scales light to deep purple. Capsule densely pubescent, \pm purplish. Flowers after the leaves in late spring. Carpeting wetish, open, arctic habitats.--F-Aka, (L-NF), Q-Man-(nS), BC, wUS -- Var. nivalis (Hooker) Andersson (S. nivalis Hooker, var. saximontana (Hydb.) Schneider; S. saximontana Hydb.) -- Leaves entire. Often smaller and more completely buried underground except for the leafy tips. Leaves often smaller, mostly 0.5-2.0 cm long. Catkins rather short, mostly less than 1 cm long. Flowers after the leaves in late spring to mid-summer. Carpeting alpine prairies.--swAlta-sBC, wUS.

8. S. vestita Pursh (var. erecta Andersson) -- Much like the preceding, but more pubescent and the branches not buried. Trailing to erect, 1-5-(10) dm high. Twigs grayish and densely pubescent. Leaves nearly always densely whitish-silky below. Petioles short, mostly about as long as the buds. Scales yellowish. Capsules grayish-pubescent. Flowers just after the leaves in early summer. Wet, shaded subarctic habitats, or subalpine near timberline.--(F)-K, L-NF, Q-(O)-Man, Alta-BC, US.

In 1838 Hooker described a var. nana, "glabra, foliis multo minoribus amentis pauci-(6-8)-floris" from the Rocky Mountains. The exact disposition of this name remains in doubt. If it proves to be synonymous with var. nivalis of the previous species as proposed by Cronquist 1964, var. nana will have to supersede var. nivalis. However, such smaller (=f. mensalis Fern.) or nearly glabrous (=var. psilophylla Fern. & St. John) types also occur as extremes of variation of S. vestita and the correct disposition of var. nana is not obvious on the basis of its description alone.

9. S. herbacea L. -- Very small and completely buried except for the leaves and catkins. Glabrous throughout or nearly so. Petioles short. Leaves about 1 cm, orbicular, crenate-serrate, often lined with red at margin, green on both faces. Aments subterminal, small, less than 1 cm long and few-flowered. Capsule glabrous, deep red, short stipitate. Flowers after the leaves in early summer. Arctic prairies.--G-K-(Mack), L-(NF), Q, (nMan, US), Eur.

10. S. arctophila Cockerell -- Generally similar to the following, not so deeply buried and less pubescent. Branches trailing, often ascending at tip. Leaves sometimes sericeous, commonly glabrous, slightly shiny above, glaucous below. Catkins 3-9 cm long at maturity, terminating lateral leafy shoots. Ovary sometimes tomentose when very young, soon becoming lightly pubescent to glabrous, red to dark purple, often drying blackish. Scales about the same colour as the capsules and not conspicuous except for their abundant and very long pilosity. Flowers with the leaves from mid-spring to mid-summer. Mostly wet gravels in arctic tundra.--(G-F)-K-Y, L-(NF), Q-(nO)-nMan, (US).

Quite closely related to the following with which it is largely sympatric.

11. S. arctica Pallas (var. araioclada (Schneider) Raup, var. torulosa (Trautv.) Raup) -- Half-buried trailing shrub with large and stiffly erect catkins. Foliage mostly glabrous, or somewhat villous. Leaves mostly 2-5 cm long, mostly obovate to oblanceolate, entire or minutely serrulate, rather dull above, slightly paler to glaucous below. Catkins 2-4-(8) cm long at maturity, terminating lateral leafy shoots, strongly two-toned because of the contrasting capsules and scales. Capsules densely grayish to whitish-tomentose. Scales dark brown to blackish, long pilose. Flowers with the leaves before mid summer. Wet alpine slopes.--(G)-F-Aka, L-(NF), Q-n0, wAlta-BC, US, (Eur).

Rather variable and many varietal or specific segregates have been proposed of which some are very rare and hence highly localized. The more common phenotypes tend to have the distribution of the species and are accordingly not reckoned as significant with the exception of S. arctophila.

11 X. S. arctica X glaucia -- Has been reported for Jasper.--(G, Y, NF, nQ, swAlta-seBC, US).

12. S. glauca L. var. glaucia (S. desertorum Rich.; S. glaucops Andersson) -- A middling shrub, rather branchy, mostly about 1 m high, with grayish-tomentose twigs and a general dull-gray appearance; the foliage and catkins much as in S. arctica. Foliage often somewhat villous when young, usually glabrous at maturity. Petioles well developed. Leaves 2-5 cm long, mostly broadly oblanceolate, dull green above, glaucous below, entire or nearly so. Catkins terminating short, leafy lateral shoots. Capsules tomentose, at first grayish-white, later pale green to pale brown, short stipitate. Scales very pale yellow and as pale as the capsule, varying to brown and obviously darker than the capsule, lightly tomentose to somewhat villous, but not conspicuously so. Flowers with or after the leaves, but before mid summer. Frequent in arctic or subarctic, alpine or subalpine habitats.--(G-K)-Mack-(Y)-Aka, (L), nwQ-(O)-nMan-BC, (US, Eur) -- Var. Macounii (Rydb.) Boivin (S. cordifolia Pursh, var. callicarpaea (Trautv.) Fern.) -- Less pubescent. Usually lower, mostly 1-5 dm high and leaves broader, obovate to oblong. Not always clearly distinct and the specimens from our area are mostly transitional.--(G-F)-K-(Mack)-Y, L-(NF-SPM, NS), Q-O-(Man).

Highly variable like the precedent and a wide selection of phenotypes have received names. The more eastern material is usually distinguishable as var. Macounii.

Many collections have been reported as the putative hybrid S. brachycarpa X glaucia (= S. wyomingensis Rydb.) All those we have examined were more like one or the other of the numerous variants of S. glauca or S. brachycarpa.

13. S. brachycarpa Nutt. var. brachycarpa (var. antimima (Schneider) Raup, var. psammophila Raup, var. Sansonii C.R. Ball; S. brachycarpa X glaucia AA.) -- A smallish, grayish and branchy shrub with nearly sessile leaves. Densely soft-pubescent throughout, rarely glabrescent at maturity. Usually less than

1 m high. Leaves (1)-2-3-(5) cm long, oblong to oblong-lanceolate, entire, glaucous below. Petiole very short, usually less than 1 mm long. Catkins short, terminating short lateral shoots with leaves about as large as those of other sterile lateral shoots. Capsules 4-7 mm long, tomentose, subsessile. Scales pale. Flowers with the leaves in late spring to early summer. Bogs and wet ground.--seK-(Mack)-Y, Q-(O)-Man-BC, nwUS.

Specimens from the sand dunes around Lake Athabaska tend to be more densely pubescent and were described as var. psammophila. Other described segregates seem to have the range of the species and are not considered to be significant, one exception being the more northern var. Mexiae C.R. Ball, a larger plant, the leaves mostly 3-5 cm long, often glabrous or nearly so above, and the catkins longer, mostly 2-4 cm long.

There is a dot in northern Manitoba on a map of S. niphoclada Rydb. (=var. Mexiae) in Porsild 1957. It may be only the result of a lapsus calami as the species is not mentioned in Scoogan's Flora of Manitoba published the same year and we found no corresponding specimen at CAN in 1962.

Putative hybrids of S. brachycarpa X S. glauca parentage are not readily distinguishable from var. Mexiae. However reports of this hybrid within our area were apparently based on ordinary specimens of S. brachycarpa.

13X. S. Argusii Boivin -- Hybrid with S. candida. Similar to the above but the branchlets, leaves and catkins floccose-tomentose in the manner of S. candida, not sericeous. Leaves oblong-lanceolate, the main ones 3-4 cm long., 1.0-1.8 cm wide. Sand dunes near Churchill.--(seQ), nMan.

13Xa. S. brachypurpurea Boivin -- Apparently a hybrid with S. lutea var. Turnorii and similar to the last, similarly purplish, but more pubescent and the catkins borne on leafy shoots. New leaves white-tomentose, becoming grayish villous on expanding, glabrescent at maturity. Petioles 1-3 mm long. Catkins terminating short leafy shoots which bear 4-8 leaves only half as large as those of the sterile shoots. Capsule grayish villous. Dunes between Little Gull and Athabaska Lakes.--nwS.

Hybr. n. Ad S. lutea var. Turnorii vergens, sed pubescentior et ramis fertilibus foliosis. Folia in primis albotomentosa, deinde grisea in aetate glabrescentia. Petiolus brevis, 1-3 mm. Rami fertiles foliosi, foliis 1.0-2.5 cm long et 4-8 in ramo. Capsula purpuracens sed griseo-villosa. Type: G.W. Arnus 221-62, Northern Saskatchewan, south shore of Lake Athabaska, east of Williams River, sand dunes north of "Little Gull" Lake, lat. 59N, long. 109W, lee slope of dune, 27 June 1962 (DAO).

14. S. MacCalliana Rowlee -- A colonial shrub with the foliage rather similar to that of S. serissima, equally thick, glossy above and paler but not glaucous below, glandular-serrulate, acute but not caudate at tip. Midnerve sharply yellow. Catkins terminating short lateral shoots. Stamens only two. Ovary and capsule white-tomentose, short stipitate. Scales

persistent, rather large and conspicuous, \pm glabrous in the upper half and dirty brown, at least half as long as the ovary or capsule and seemingly enlarging at maturity, becoming 3-5 mm long. Flowers with the leaves, from early to late spring. Swamps.--sMack, cQ-eBC, (US).

15. S. pyrifolia Andersson (S. balsamifera Barratt) -- A bog species, rather strongly balsam-scented and thin-leaved. Even in the herbarium, the leaves remain balsam-scented for years. Glabrous shrub, 1-3 m high. Stipules small and nearly always absent. Leaves 3-6 cm long, ovate to lanceolate, thin, shining green above, glaucous below, serrulate, acute at tip, mostly cordate at base. Catkins large, on very short shoots bearing leaves less than half the size of leaves on sterile shoots. Capsules glabrous, purplish. Stipe glabrous and long, subtended by a shorter, villous and tomentose scale. Flowers with the leaves around mid-spring. Very wet places, especially at the edge of bogs.--(seK-Mack), J-L-NF, (NS-NB)-Q-Alta-(BC, US).

16. S. monticola Bebb (S. Barclayi AA.; S. Farrae C.R. Ball; S. padophylla Rydb.; S. pseudomonticola C.R. Ball, var. padophylla (Rydb.) C.R. Ball) -- The foliage much as in the preceeding but thicker and with stipules 5-10 mm long, conspicuous, nearly always present, especially on the leading shoots. Branchlets puberulent. Catkins sessile and leafless to short-peduncled and with 1-3 very small leaves. Capsules yellowish to purplish, often half hidden by the villosity of the scales. Stipe variable. Scales small and very long villous, the hairs longer than the scales, sometimes glabrous. Flowers before or with the leaves in early spring. Shores and wet places.--(Mack)-Y-Aka, (L), Q-BC, US.

After the catkins have fallen off, it may not be readily distinguished from S. mackenziana except that the latter tends to narrowly oblanceolate leaves while they are mainly broadly oblanceolate in S. monticola.

17. S. lutea Nutt. var. lutea -- Last year's twigs yellow, the new ones often reddish, the older ones turning gray. Tall shrub, 2-4 m high. Foliage glabrous, except when very young. Stipules smallish, nearly always present. Leaves lanceolate, short-acuminate, serrulate, glaucous below. Catkins subsessile and bracteate at base. Capsule glabrous, pale green to reddish, long stipitate. Scales brown, small, long villous, persistent. Flowers in mid spring, with or slightly before the leaves. River banks and ditches.--(sMack), nO-Alta, US -- Var. Turnorii (Raup) Boivin (S. Turnorii Raup) -- Strongly purplish-tinged, especially the more vigorous new shoots, the petioles, the midnerves and the capsules. Leaves thickish, usually not acuminate. Catkins tending to be shorter, mostly 1-3 cm long. Dunes on the south side of Lake Athabaska.--nWS.

Var. Turnorii (Raup) stat. n., S. Turnorii Raup, Journ. Arn. Arb. 17: 234. 1936.

A report of S. rigida Muhl. for Otterburne by Löve 1959 was based on a collection now revised to S. lutea (DAO, MT).

Other western specimens similarly identified S. rigida or S. cordata were all revised to other species, mostly S. lutea, S. mackenzieana and S. monticola.

The more eastern S. cordata Mx. and its var. rigida (Muhl.) Carey tend to be more pubescent, the larger leaves are usually quite clearly cordate, and the catkins are borne on short shoots bearing a few reduced leaves.

18. S. mackenzieana (Hooker) Barratt -- The red tinted stipes very long, much overtopping the pubescence of the scales and at least half as long as the capsule. Shrub around 3 m high, with glabrous foliage, except when very young. Stipules large and usually present on leading shoots. Leaves lanceolate or narrowly lanceolate, serrulate, glaucous below. Catkins on a very short peduncle bearing quite small leaves. Capsules glabrous, often reddish. Scales brown, small, very loosely tomentose rather than villous. Flowers probably early. Along streams.--(Mack-Y), wS-BC, US.

19. S. Barclayi Anderson -- The leaves soon glabrous below, but remaining villous-pubescent above, especially along the mid-nerve, at least till mid summer; the coarse twigs rather jet black in the herbarium. Very young twigs often whitish-villous. Stipules mostly present and rather variable. Leaves mostly broadly obovate, serrulate, acute to rounded at tip, slightly glaucous below, tending to blacken in drying. Catkins on a short peduncle, bearing a few half-size or smaller leaves. Capsules glabrous, at least half buried in the very long villosity of the scales. Styles elongate, over 1 mm long. Stipe less than half as long as the blackish, lanceolate, long-villous scales. Probably flowers in late spring, or early summer, after the leaves. Near mountain lakes and creeks, below timberline.--(Mack)-Y-Aka, Alta-BC, (nwUS).

20. S. commutata Bebb (var. denudata Bebb) -- Much like the preceding in its black twigs; the pubescence, leaves and stipules similar, but the leaves equally green and equally villous on both sides, becoming equally glabrous. Catkins terminating short lateral shoots bearing a few somewhat reduced leaves. Stipe very short. Scales brownish, small, loosely tomentose to long-villous. Styles mostly less than 1 mm long. Flowers after the leaves in late spring. Near mountain lakes and creeks: Cameron Lake.--(wMack-sAka), swAlta-BC, (US).

21. S. myrtillofolia Andersson (var. brachypoda Fern., var. pseudomyrsinites (Andersson) C.R. Ball; S. curtiflora Andersson; S. pseudocordata (Andersson) Rydb.) -- A smallish bog species, commonly half buried in Sphagnum and looking somewhat like a Blueberry bush (i.e. like Myrtillus). Mostly 3-6 dm high. Stipules insignificant and mostly absent. Leaves oblong to lanceolate, mostly 2-5 cm long, soon glabrous, serrulate, acutish to obtuse at summit, slightly paler to slightly glaucous below. Catkin terminating a short lateral branch with nearly normal to slightly reduced leaves. Stipe slightly shorter to slightly longer than the scale. Scale puberulent to villous,

strongly two-toned, pale yellow nearer the base, blackish nearer the tip. Flowers after the leaves in late spring. Marshy places, mostly in Black Spruce bogs.--(oF)-K-Aka, L-(NF), NB-BC, US.

22. S. Bebbiana Sarg. (var. capreifolia Fern., var. perrostrata Rydb.; S. rigida Rich.) -- (Chaton, Petit Minou) -- Very loose catkins of finely silky capsules on very long pedicels. A very common species, colonial, a bush or a small tree, with the general appearance of S. discolor and not infrequently confused with it. Leaves fairly variable, typically the early leaves are villous or short sericeous when young, while the later leaves are felty-tomentose below when young, becoming nearly glabrous, without rusty hairs, broadly oblanceolate, entire to weakly glandular-serrulate, glaucous below. Vigorous shoots usually bearing large stipules and crisp-margined leaves, the elongating branchlets grayish-tomentose. Catkins flowering from base to summit, borne on a very short peduncle bearing a few bracts or some very reduced leaves about as long as the capsules. Scales yellowish, somewhat villous, the villosity more or less overtopped by the stipes. Flowers in early spring with the leaves or almost ahead of them. All kinds of wet and not so wet or very wet places.--K-Mack-(Y)-Aka, (L-NF, NS-PEI)-NB-Man-(S)-Alta-BC, (US).

23. S. calcicola Fern. & Wieg. (var. glandulosior Boivin) -- A low arctic shrub, flowering before the leaves. Up to 1.5 m tall but usually much lower, to depressed and trailing. Twigs coarse, the younger ones abundantly spreading-villous, becoming dark coloured and usually blackish. Leaves very variable, round to lanceolate, mostly ovate, often broadly cordate at base, entire to glandular-serrulate, glaucous below, with a thick and short petiole. Stipules commonly present and large. Catkins sessile, leafless at base, rather large, dense and thick, at maturity 5-10 cm long. Capsules rather large, almost sessile. Scales very long, very black and very long-villous, the villosity not infrequently overtopping the capsules. Very early spring, before the leaves. Wet tundra and mountain river gravels.--F-K-(Mack), L-(NF), Q-neMan, swAlta.

Reports of S. Richardsonii Hooker from Churchill proved to be based on specimens of S. calcicola and S. planifolia.

24. S. Barrattiana Hooker (var. angustifolia Anderson) -- The leaves densely and permanently soft villous on both faces. Very variable in size, commonly around 1 m high. Twigs becoming coarse, permanently long spreading villous, darkish and with very prominent leaf scars. Leaves lanceolate, slightly paler below, entire to minutely glandular-serrulate. Catkins dense, rather large, 6-10 cm long at maturity, subsessile, the very short peduncle usually bracteolate. Capsules large, short stipitate, densely puberulent to white-sericeous, at least half buried in the long pilosity of the long and very black scales. Flowers in early spring before the leaves. Near lakes and creeks, mostly above timberline.--(Mack-Y)-Aka, (Alta-BC, nwUS).

25. S. alaxensis (Andersson) Cov. -- New twigs permanently white felty-tomentose. Mostly 1-3 m high. Leaves obovate to oblanceolate, slightly revolute and entire or minutely glandular-serrulate at margin, green and nearly glabrous above, white felty-tomentose below. Stipules large and mostly present. Catkins large, dense, up to 7-12 cm long at maturity, sessile on old wood, bractless to bracteolate at base. Capsules densely puberulent, subsessile. Scales long, black and very long villous, the villosity about equalling the top of the capsule. Flowers in early spring before the leaves. Along alpine and arctic or subarctic lakes and streams.--F-Mack-(Y-Aka, nQ, nMan, swAlta-nBC, Eur) -- F. longistylis (Rydb.) Boivin (var. obovalifolia C.R. Ball) -- The twigs not pubescent beyond the first year, often heavily pruinose the second year.--(K-Aka, nQ, nMan, (Alta) -- Var. silicicola (Raup) Boivin (S. silicicola Raup) -- More pubescent, the leaves grayish-tomentose above and somewhat concave. Subarctic lake dunes.--sMack, nWS.

26. S. pedicellaris Pursh var. pedicellaris (var. hypoglauca Fern.; S. myrtilloides ssp. pedicellaris (Pursh) Andersson) -- A smallish bog species with entire, subrevolute and smallish leaves. Mostly 3-6 dm high. Leaves ovate or oblong-lanceolate, to narrowly lanceolate, mostly 2-4 cm long and glabrous, strongly glaucous below. No stipules. Catkins small, mostly 1-3 cm long at maturity, terminating normal-size lateral shoots which bear normal-size leaves. Capsules small, glabrous, often purplish, long stipitate. Scales small, pale, often with a large dark purple patch, glabrous to villous. Mid to late spring, after the leaves. Very wet places, mostly in open Black Spruce bogs.--(K)-Mack-(Y), L-SM, NS, NB-BC, (US) -- Var. athabascensis (Raup) Boivin (S. athabascensis Raup; S. fallax Raup; S. glauca X pedicellaris AA.) -- Leaves and ovaries more or less pubescent. Catkins often larger, 2-4 cm long. Stipe often shorter.--(Mack)-Y, neC-(Man)-S-(Alta-BC).

26 X. S. pedicellaris X phylicifolia (S. pedicellaris X planifolia) -- Has been recently reported for a few northern localities.--(nS).

27. S. discolor Muhl. var. discolor (var. Overi C.R. Ball, var. prinoides (Pursh) Andersson) -- Pussy-Willow, Diamond-Willow (Chaton, Petit minou) -- A most common and most conspicuous species in very early spring, when it flowers so early that the capsules are almost ripe by the time the leaves come out. Colonial shrub to small tree. Leaves variable, obovate to lanceolate, mostly broadly oblanceolate, entire to serrulate or sinuate, glabrous at maturity and strongly glaucous below. Stipules smallish and mostly absent. Catkins subsessile on old wood, bractless and leafless, rather large, mostly 4-8 cm long at maturity. Capsules about 1 cm long, attenuate, densely puberulent. Scales black, long pilose, from about as long to about twice as long as the stipe. Styles 0.5-1.0 mm long. One of the earliest plants to flower. Most common where the land is subject to flooding right after the melting of the snow.--

(L-NF, NS-NB)-Q-O-(Man-S)-Alta-(BC), US -- Var. latifolia Andersson (f. hirsuta Andersson, var. eriocephala Andersson; S. Scouleriana Barratt, var. coetanea C.R. Ball) -- Leaves remaining more or less velvety below at maturity. Branchlets generally velvety. Frequent and more common westward.--(Mack-Aka, Q-Man)-S-(Alta)-BC, US.

28. S. humilis Marsh, var. humilis -- Leaves thick-velvety below, the lateral nerves immersed in the white pubescence. Rather similar to S. discolor var. latifolia, but generally smaller. Shrub 0.4-3 m high. Twigs cinereous-puberulent to velvety. Leaves glaucous below, sometimes glabrous. Catkins short-petioled, bractless and leafless at base, 2-4 cm long at maturity. Style rather short, 0.2-0.5 mm long. Flowers very early, long before the leaves. Dry open places, tolerates spring flooding.-- L-NF, NS-nAlta, US -- Var. microphylla (Andersson) Fern. (S. tristis Aiton) -- Generally only half as large. 1 m high or less. Leaves mostly 3-5 cm long. Fruiting catkins 1-2 cm long. Late spring before the leaves. Wetter spots in the prairie--(O)-sMan, US.

29. S. petiolaris Sm. (var. gracilis Andersson, var. rosmarinoides (Andersson) Schneider, var. subsericea Andersson; S. gracilis Andersson, var. textoris Fern.; S. subsericea (Andersson) Schneider) -- The leaves rather narrow and glaucous below with a conspicuously yellow midnerve. Tufted shrub, mostly 1-3 m high, slender branched, the twigs deep red when fresh, usually blackening in drying. Leaves usually linear-lanceolate, at first appressed-pubescent, becoming glabrous or nearly so, serrulate. Stipules absent. Catkin on a short leafy peduncle, the leaves rather variable in size, often very small and not infrequently caducous. Stigma sessile or nearly so. Capsules finely silvery-silky, 5-7 mm long, the stipe usually well developed and as long to much longer than the brownish and villous scales. Flowers in early spring with the leaves. Moist places--sMack, NS-Alta-(BC), US.

29X. S. Clarkei Bebb -- Hybrid with S. candida and the pubescence rather tomentose, but becoming + appressed-sericeous on the smaller and earlier leaves. Leaves glaucous below. Capsule tomentose, usually with a short pedicel and a long style. McKague.--S, (US).

30. S. candida Flügge -- A common bog species, the leaves narrow and covered below with a snow-white tomentum. Mostly about 1 m high, the twigs + grayish or floccose-tomentose. Leaves lanceolate or narrower, entire to crenulate or serrulate, revolute at margin, + floccose above. Catkins terminal on short, lateral branches bearing a few much-reduced leaves. Style elongate. Capsule white-tomentose, with a short stipe, subtended by a longer, dark and villous scale. Flowers with the leaves in mid-spring. Muskegs and sometimes marshes.--K-Y-(Aka, L)-NF-SPM, NS-PEI-(NB)-Q-BC, US -- F. denudata (Andersson) Rouleau -- Leaves more or less glabrous below. Occasional.--NF, Q-O, S-(Alta).

31. S. phyllifolia L. var. phyllifolia (ssp. planifolia (Pursh) Breitung, var. Nelsonii nomen; S. planifolia Pursh, var. Nelsonii (C.R. Ball) E.C. Smith) -- Rather similar to S. discolor and readily confused with it, but flowering somewhat later. Also the leaves more glaucous below and more entire, the twigs and branchlets more strongly blackened in drying. Leaves mostly broadly oblanceolate, soon glabrous. Catkins on a short peduncle and usually bracteolate at base. Capsules densely puberulent, subsessile. Scales black, long pilose. Flower early before the leaves. Wet places, especially if subject to spring flooding.--(F-K)-Mack-(Y, L-SPM), Q-O-(Man-S)-Alta-(BC, US), Eur.

Taken as a group, the American specimens (S. planifolia) have a less pronounced denticulation than the eurasian ones, but the difference is not sharp enough to be taxonomically tenable.

A more northern var. subglaucula (Andersson) Boivin has longer, narrower and marcescent stipules.

32. S. pellita Andersson var. pellita -- The narrow leaves densely silky-pubescent below, appearing somewhat silvery. Usually a tall shrub and mostly with strongly pruinose twigs. Leaves lanceolate to linear, not floccose, but finely puberulent above, minutely glandular-serrulate, but appearing somewhat entire due to the revolute margin. Catkins subsessile and bracteolate at base. Capsule more or less white-silky and rather small, 4-5 mm long, subsessile and subtended by a dark brown to black, long-villous scale. Styles 1 mm long or more. Flowers very early before the leaves. Shores.--(L)-NF-(SPM, NS, NB)-Q-(O-Man)-S, (US) -- F. psila Schneider -- Leaves glabrescent and strongly glaucous below, except for the half grown new leaves. Local.--Q-(O-S) -- Var. angustifolia (Bebb) Boivin (S. Drummondiana AA., var. bella (Piper) C.R. Ball, var. subcoerulea (Piper) C.R. Ball) -- Pubescence of the underside of the leaves shorter, more compact and more uniform. Hairs (0.2)-0.3-(0.5) mm long--(Y, Alta-BC, US).

33. S. arbusculoides Andersson -- Much resembling S. petiolaris but the leaves permanently silky below and the catkins narrower and longer. Usually a tall, tufted shrub with thin branches. Leaves lanceolate or narrower, glabrous above even when very young, glandular-serrulate. Catkins terminating very short branches bearing a few much-reduced leaves at base. Capsules 3-7 mm long, densely sericeous, subsessile. Scales small, dark brown, somewhat villous. Flowers early with the leaves. Mostly on river banks.--(K)-Mack-(Y-Aka), Q, (nMan)-S-(Alta-BC) -- F. glabra (Andersson) Boivin (S. Tyrellii Raup) -- Foliage and capsules glabrous.--(S).

34. S. sitchensis Sanson -- The ovoid capsules very small, 2.5-3.5 mm long, and white-silky at least when young. Pubescence much as in S. pellita, but the leaves broader, oblanceolate to elliptic-oblanceolate and the twigs not bluish. Leaves white-silky below, lightly silky above, sometimes becoming only lightly silky on both faces at maturity. Catkins varying from

sessile and bractless to short-peduncled and leafy-bracted at base. Scale brown to black, long villous. Flowers now with the leaves, now much earlier. Mountain streams: Waterton.--sAka, Alta-BC, wUS.

Re S. nigra Marsh. reported from near Maple Creek by Macoun 1886, see comment under Rosa nutkana.

Order 10. MYRICALES

A single family.

18. MYRICACEAE (SWEET-GALE FAMILY)

Like the Salicaceae, but the ovary one-celled and one-seeded. Seed devoid of pappus. Ovary subtended by a group of bracts. Single genus.

1. MYRICA L.

SWEET-GALE

Catkins borne on separate leafless branches.

1. M. Gale L. -- Bog-Myrtle, Gold-Withy (Bois-sent-bon, Herbe à cheval) -- Shrub forming large colonies. Leaves cuneate-oblongate, serrate towards the apex, with numerous yellow resin dots below. Catkins borne in a spike on a separate leafless branchlet. Mid spring, before the leaves. Bogs and boggy shores.--K-Aka, L-SPM, NS-BC, US, Eur.

We have found no specimen to justify a report by Gleason 1952 of M. aspleniifolia L. from Saskatchewan. See comment under Buchloë dactyloides.

Order 11. FAGALES

Much as in the Myricaceae, but the ovary inferior and with 3 or more cells and ovules, only one of which matures. Calycul present.

a. Male and female flowers calyculate 21. Fagaceae

aa. Either, but not both, with a calycul.

b. Male flowers calyculate 19. Betulaceae

bb. Female flowers calyculate 20. Corylaceae

19. BETULACEAE (BIRCH FAMILY)

Both male and female flowers borne in long catkins. Each seed subtended by a bract.

a. Pistillate catkins axillary 1. Betula

aa. Pistillate catkins in a leafless panicle or raceme 2. Alnus

1. BETULA L.

BIRCH

Seeds with two wings. Pistillate scales thin and trilobed. Buds sessile.

a. Shrub with compact bark; petiole 5 mm long or less (except sometimes on leading shoots) 4. B. nana

aa. Tree with papery bark; petiole longer.

- b. Bark purple brown; petiole 1 cm long or less (except sometimes on leading shoots) 3. B. occidentalis
- bb. Bark chalky-white to pink; petiole longer.
- c. Leaves glabrous 2. B. neoalaskana
- cc. At least pubescent below in the axils or the main nerves 1. B. papyrifera

1. B. papyrifera Marsh. var. papyrifera (var. commutata (Regel) Fern; B. Winteri Dugle) -- Birch, Paper-Birch (Bouleau, Bouleau à papier) -- A tree with the outer bark readily peeling off in paper-thin sheets. Bark colour mostly whitish-gray or chalky-white. Twigs minutely puberulent, often somewhat glandular-verrucose. Leaves ovate to rhomboid, serrate, rounded to truncate at base, pubescent below with tufts of hairs in the axils of the main nerves, otherwise usually glabrous. Catkins pendulous, mostly 4-5 cm long. Very early spring before the leaves. Mostly along banks and bluffs of larger rivers.--Mack-(Y)-Aka, L-NF-(SPM), NS-BC, US -- Var. cordifolia (Regel) Fern. (var. subcordata (Rydb.) Sarg.; B. cordifolia Regel) -- Leaves mostly cordate and usually doubly serrate. More pubescent, the twigs and petioles abundantly pilose. Leaves pilose along the nerves on both faces, more so and often velvety below. Catkins often stubbier. Bark tending to gray. Scattered tree in Spruce forests.--sMack, L-NF, NS, NB-BC, US.

The distinction between var. papyrifera and var. cordifolia is quite sharp in some parts of Canada, hence some authors will quite understandably treat the two taxa as specifically distinct.

B. Winteri was originally described as the hybrid B. neoalaskana (= B. resinifera) X papyrifera. Some of the specimens cited came from well outside the range of B. neoalaskana (West Hawk Lake, Craven, etc.) and it seems highly questionable that these could represent a hybrid as postulated. About two thirds of the syntypes were examined and most seem to belong to B. papyrifera. One collection from Mt. Saskatoon could be doubtfully retained as a possible B. neoalaskana X papyrifera, yet it seems closer to B. neoalaskana. The type collection has not been seen.

2. B. neoalaskana Sarg. var. neoalaskana (B. papyrifera Marsh. var. humilis AA., var. neoalaskana (Sarg.) Raup; B. resinifera AA.) -- White Birch -- Much like the preceding, somewhat smaller and with smaller thickish leaves. Twigs densely glandular-verrucose. Bark white to pale pinkish brown. Leaves deltoid-ovate, simply serrate, short caudate, glabrous. Catkins descending, 2-3 cm long. Early spring, before the leaves. Scattered in Spruce forests, especially on wetter sites.--(K)-Mack-Aka, nO-nBC.

B. resinifera Britton was based on a B. alba L. var. resinifera Regel which was in turn based on a Middendorf collection from Siberia. As our species does not occur in Siberia,

the epithet resimifera is obviously not available to designate our plant as some authors have done, unless one is willing to divorce B. resinifera from its basionym by Regel; this certainly is not a practice condoned by the International Code of Botanical Nomenclature.

In Rhodora 47: 321-3. 1945, Fernald typified B. alba L. var. humilis Regel in the sense of B. neoaslaskana by selecting as the type a Bourgeau sheet from the "Bords de la rivière Castor" in Saskatchewan. However, in his original description Regel included as a synonym B. papyrifera var. minor Tuck. and he also cited Tuckerman's collection from the White Mountains. There is no evidence that Regel meant to describe a var. humilis different from a var. minor; quite the contrary, var. minor and its type were unequivocally included by Regel in his var. humilis. We are therefore, of the opinion that the type of var. minor automatically becomes the type of var. humilis and that the 1945 type selection was both superfluous and incorrect.

In Yukon and Alaska there occurs a var. kenafca (Evans) Boivin which differs from our typical variety by its leaves not caudate. Also they are usually pilose above and also towards the margin below.

3. B. occidentalis Hooker var. occidentalis (B. arbuscula Dugle; B. Eastwoodae Sarg.; B. fontinalis Sarg.; B. uliginosa Dugle) -- Mountain Birch, Black Birch (Merisier rouge) -- A smaller and usually tufted species of sandy soils with dark, purple-brown, papery bark, but the layers not peeling off readily. Young leaves and twigs lightly pilose and very resinous, soon glabrous, rarely densely puberulent. Leaves small, round-ovate, usually glabrous. Catkins spreading, 1-2 cm long. Early spring before the leaves. Sandy shores and hollows between sand dunes.--K-(Mack)-Y-Aka, NS, NB-BC, US.

West of us it grades into a more pubescent var. inopina (Jepson) C.L. Hitchcock, the twigs strongly pubescent and the leaves pubescent below, bearing hair tufts in the axils of the main nerve junctions.

There has been some disagreement as to the correct interpretation of B. occidentalis. As pointed out by Hitchcock 1964, Hooker obviously intended to describe the plant later renamed B. fontinalis. An earlier and rejected typification by Sargent was in the sense of one of the variants of B. papyrifera because it was cited first, as was the practice of the tenants of the American Code. The International Code of Botanical Nomenclature allows retypification whenever an earlier one is demonstrably in error. This is applicable here and B. occidentalis should be typified in the sense of the specimens and notes by Drummond and Douglas. The concept of nomen confusum is not applicable here since the name is obviously typifiable one way or another.

B. utahensis Britton (= B. Andrewsii Nelson), a putative hybrid of B. occidentalis X papyrifera, was described from Utah and recently reported from Yukon, Alberta and B.C. by J.R. Du-

gle, Can. Journ. Bot. 44: 972-983. 1966. Many specimens revisited by Miss Dugle are at hand from B.C. Saskatchewan and Mackenzie, the latter two areas are not yet reported in the botanical literature. The many B.C. specimens fit into our concept of B. occidentalis Hooker var. inopina (Jepson) C.L. Hitchc., while the Sask. sheet belongs to typical B. occidentalis and the many Mackenzie sheets fit better in B. neoalaskana. The correct disposition of the Yukon and Alberta reports remains in doubt as the relevant sheets have not been examined.

B. uliginosa was described as a putative hybrid of B. glandulifera (= B. nana var.) X resinifera (= B. neoalaskana) from two localities in central Alberta. A photo of the type gives the superficial appearance of B. occidentalis; but none of the specimens cited were at hand for examination. However, a large number of authentic specimens are available ranging from Manitoba to B.C.; mostly they belong to B. occidentalis, the remainder to B. nana var. glandulifera and a few of them were collected outside the range of one of the putative parents.

The type of B. Eastwoodae was illustrated in Can. Journ. Bot. 44: 953. 1966. It is obviously similar to B. uliginosa illustrated on the page facing and neither seem to differ significantly from B. occidentalis. Most of the many specimens cited or identified as B. Eastwoodae fall within our concept of B. occidentalis, but the Saskatchewan ones belong to B. nana var. glandulifera.

4. B. nana L. var. sibirica Led. (B. glandulosa Mx.) -- Swamp Birch (Bouleau de savane) -- A thin shrub with small roundish leaves. Twigs glandular-verrucose, with variable pubescence, usually velvety puberulent. Leaves mostly 1-2 cm long, obovate to rotund or flabellate, crenate-serrate. Catkins 1-2 cm long. Early spring before the leaves. Boggy places. -- (G-F)-K-Aka, L-(NF, NS, NB)-Q-Man-(nS)-Alta-BC, US, (Eur) -- Var. glandulifera (Regel) Boivin (B. glandulifera (Regel) Butler; B. glandulosa Mx. var. glandulifera (Regel) Gleason; B. pumila L. var. glandulifera Regel; B. Sargentii Dugle) -- Leaves larger, mostly 2-3 cm long, obovate and cuneate at base, more glaucous below. Marshes and bogs. -- (K)-Mack-Y, L, Q-BC, US.

Intermediates between our two varieties are quite common and B. Sargentii was created precisely to designate them.

4X. B. Sandbergii Britton -- Hybrid of B. papyrifera. Rather variable, a tall shrub or small tree with dark brownish bark in the manner of B. occidentalis. Petiole somewhat less than 1 cm long, except on strong leading shoots. Leaves mostly about 3 cm long, broadly ovate to rhomboid-ovate, rounded to subacuminate at tip, rather finely but irregularly serrate, thickish and glutinous, but ± pubescent below, especially in the main axils. Shores and bogs, rare: Saint-Norbert. -- O-sMan, (US).

Recently reported, Can. Journ. Bot. 44: 992-7. 1966, from a number of additional localities west to Alberta. Most sheets so-named and examined were more characteristic of B. occidentalis while a few rather resembled B. papyrifera or B. nana var.

glandulifera.

2. ALNUS B. Ehrhart

ALDER

Seeds winged or wingless. Pistillate scales very thick and somewhat woody, not lobed. Buds sessile or stipitate.

- a. Buds sessile; seeds winged 1. A. viridis
 aa. Buds stipitate; seeds wingless,
 merely thin-margined 2. A. incana

1. A. viridis (Chaix) DC. var. sinuata Regel (A. crispa (Aiton) Pursh, var. mollis Fern., ssp. sinuata (Regel) Hultén) -- Alder, Green Alder (Aulne, Bois à rames) -- A shrub bearing woody ellipsoid catkins about 1.5 cm long. Very glutinous when young, pubescent to glabrous. Leaves ovate, serrate to nearly doubly serrate, green and often shiny below. Flowers in mid spring after the leaves. Often forming a continuous understory in Coniferous woods.--G, (K)-Mack-Aka, L-NF-(SPM), NS-BC, US.

Not always clearly distinct from the eurasian var. viridis. Our var. sinuata is commonly a larger shrub with much larger leaves and somewhat longer pedicels and pistillate catkins. Var. mollis is an extreme of pubescence which will be found to be somewhat more obvious and more common eastward.

2. A. incana (L.) Moench var. incana (var. virescens Watson, ssp. rugosa (DuRoi) Clausen, ssp. tenuifolia (Nutt.) Breitung; A. rugosa (DuRoi) Sprengel, var. americana (Regel) Fern., f. hypomalaca Fern.) -- Alder, Speckled Alder Mountain Alder (Aulne, Verne) -- A shrub or small tree with stipitate buds, the stipe 1-2 mm long. Leaves ovate, doubly serrate, green to glaucous below, densely puberulent to nearly glabrous. Flowers very early before the leaves. Shores of streams and lakes.--Mack-Aka, L-SPM, NS-BC, US, (CA), Eur.

We cannot detect a satisfactory difference between the european A. incana and the american A. rugosa. The best character appears to be the colour of the pubescence and on this basis one could distinguish an american var. americana Regel (not the earliest epithet available) with the pubescence of the underside of the leaves + light brown, especially in the axils of the nerves, but sometimes white. In var. rugosa, the pubescence is white and only exceptionally brown tinted. Many other characters have also been stressed, but surely some of them are unrealistic, like the supposed difference in leaf serration, while others exhibit such a broad range of overlap as to have little practical value, even if they may have a statistical one. The difference in size has been overemphasized. The american plant is commonly a shrub 2-4 m high, especially when pioneering in wettish neglected fields. In more stable and less disturbed habitats, such as the floodplains of rivers in undisturbed forested regions, it will usually reach about 5 m with a trunk around 1 dm thick, reaching exceptionally 10-15 m and a trunk of 2 dm. The european counterpart is described as a "tree or shrub

up to 10-(25) m".

Var. virescens will designate the specimens with leaves greenish below. This phenotype is sporadic throughout the range as pointed by Hultén 1944, but it is more common in our area than the glaucous type, which in turn becomes the more common phase in eastern Canada.

Our plants have ovate and doubly serrate leaves, as contrasted with the primarily planicostal var. serrulata (Aiton) stat. n., Betula serrulata Aiton, Hort. Kew. 3: 338, 1789, with obovate and simply serrate leaves. The two varieties show a fair amount of intergrading and an A. rugosa var. subelliptica Fern. is indeed based on such intermediate material.

When A. incana and A. rugosa are treated as a single species, A. rugosa is usually given the priority because its specific epithet dates from 1788 while rugosa is supposed to date only from 1794. However there appears to be an earlier Betula incana (L.) L. f., Suppl. Pl. 417. 1781 which we have not seen but would seem to give priority to A. incana.

20. CORYLACEAE

(FILBERT FAMILY)

Nut partly to completely enclosed by a group of partly fused, accrescent bracts.

- a. Leaves simply serrate 1. Ostrya
aa. Leaves doubly serrate 2. Corylus

1. OSTRYA Scop.

IRONWOOD

Fruits in an elongate catkin. Seed small, enclosed in a large, inflated involucre of fused bracts.

1. C. virginiana (Miller) K. Koch var. virginiana -- Ironwood, Hop-Hornbeam (Bois de fer, Bois dur) -- The mature catkins resemble Hops. Small tree. Leaves elliptic-ovate, acuminate, pubescent, the terminal leaves on each twig many times larger than the lower ones. Second half of spring. Deciduous forests on hillsides.--NS, NB-sMan, US.

Quite local in our area, being known only from Morden, Sprague and Falcon Lake. It was also noted by Nicholas Garry in his diary in 1821 at Postage de Chute d'Esclave on the Winnipeg River. See Proc. Trans. Roy. Soc. Can. ser. 2, 6: 130. 1900.

In var. virginiana the twigs are glabrous to lightly pilose or sometimes stipitate-glandular. The more southern and primary planicostal var. lasia Fern. has densely pilose to velvety twigs.

2. CORYLUS L.

HAZEL-NUT

Pistillate catkin reduced to a short cluster. Involucre tightly enclosing the nut. Seed edible.

- a. Twigs densely covered with spreading glandular hairs 1. C. americana

aa. Twigs not glandular 2. C. cornuta

1. C. americana Walter -- Hazel, Filbert -- A shrub with the twigs densely beset with long, stiff, spreading, purple, glandular hairs. Leaf ovate, pubescent on both faces and somewhat glandular above. Nut largely enclosed by an involucre. Involucre flaring above the middle, leaving the top of the nut exposed. Early spring, before the leaves. Oak forests and sandy hillsides.--swQ-sMan, US.

2. C. cornuta Marsh. var. cornuta (C. rostrata Aiton) -- Hazel, Filbert (Noisettier, Coudrier) -- The nut completely enclosed by the flask-shaped involucre. Twigs not glandular, lightly pilose with somewhat appressed hairs, glabrescent. Leaves much as in the preceding but not glandular. Involucre covered with stiff, almost acicular hairs, prolonged into a tube 1.5-2.5 cm long. Early spring, before the leaves. Rocky hillsides and dry deciduous woods.--NF-SPM, NS-BC, US.

Two more varieties occur west of us.

In the intermontane area: var. californica (D.C.) Sharp with a shorter beak, 0.5-1.5 cm long, and the twigs remaining pubescent all summer.

Along the coast, south to California: var. glandulosa. var. n. Ramulis petiolisque pubescentia pilis opacis glandulosisque intertexta. Ceteris us var. californica. Type: Calder & MacKay 31517, head of Finlayson Arm below Mt. Finlayson, north of Victoria, common and scattered in open areas along river and in woods, to 15' high, July 16, 1961 (DAO). By its glandular pubescence this new variety is reminiscent of the more eastern C. americana.

21. FAGACEAE

(BEECH FAMILY)

Nut subtended by a cupule made up of a large number of fused bracts.

1. QUERCUS L.

OAK

Involucre not dehiscent.

1. Q. macrocarpa Mx. -- Oak (Chêne) -- Leaves lyrate and strongly discoloured. A tree with crooked branching. Leaves lyrate-ly lobed, dark green and nearly glabrous above, pale green and densely stellate-puberulent below. Acorn sitting in a fringed cup. Mid spring, with the leaves. Upper part of gale-rie-forests and forming bluffs on hillsides and drier prairies.--NB-seS, US.

Westward it is a gradually smaller tree (Q. mandanensis Rydb.) and becomes eventually restricted to the major coulées, namely the Souris, Pipestone and Qu'Appelle in southeastern Saskatchewan.

Order 12. URTICALES

Flowers not in catkins. Petals lacking. Calyx present,

CORYLUS

of fused sepals. Stamens as many as the calyx lobes.

a. Trees 22. Ulmaceae
aa. Herbs.

b. Non climbers 23. Urticaceae

bb. Plant climbing by its twisting
stem 24. Cannabinaceae

22. ULMACEAE

(ELM FAMILY)

Trees with distichous, asymmetrical leaves.

a. Leaf with the middle lateral nerves stronger than those above and below

..... 1. Ulmus

aa. Lower pair of nerves longest, those above gradually shorter

..... 2. Celtis

1. ULMUS L.

ELM

Fruit a round samara with the seed at the center.

1. U. americana L. -- Elm (Orme) -- A common tree with doubly serrate, asymmetrical leaves. Leaf soft-puberulent to scabrous, short-acuminate, with numerous and conspicuous, strictly parallel nerves. One side of the leaf is broader, ovate and cordate at base; the other side is obovate and cuneate at base. Flowers very early, before the leaves. Galerie-forests; often planted.--NS-(PEI)-NB-S, US.

2. CELTIS

HACKBERRY

Fruit a drupe, solitary, similar to that of a Pin-Cherry.

1. C. occidentalis L. var. occidentalis -- Hackberry, Sugarberry (Bois inconnu, Bois connu) -- A tree with the leaves very obliquely truncate at base, ovate to oblong, caudate, serrate. Fruit black, long pedicelled. Flowers in mid-spring, with the leaves. On the eastern half of the sand dune at Delta. --swQ-Man, US.

Varieties are usually distinguished primarily on the leaves being smooth or scabrous, but this character is not geographically restricted. We have distinguished two varieties on a new basis as follows:

Var. occidentalis. Leaves 6-20 cm long, mostly 1 dm or somewhat less, ovate to oblong-lanceolate, mostly semi-cordate at base, acuminate-caudate at tip. Margin regularly dentate, the teeth mostly 20-30 to a side. This is var. pumila and var. canina sensu Fernald and also var. canina and var. crassifolia sensu Gleason. A photo of the Linnean type, 1209.4, shows a Kalm specimen with caudate leaves about 8 cm long.

Var. crassifolia (Lam.) Gray. More southern, the leaves smaller, 4-10 and mostly 5-7 cm long, broadly oval and mostly rounded at base, merely short acuminate at summit. Margin mo-

re irregularly toothed with fewer teeth, mostly 10-20 teeth to a side. This is var. occidentalis sensu Fernald and also sensu Gleason.

23. URTICACEAE

(NETTLE FAMILY)

Herbs, often stinging herbs. Calyx of 2-5 fused sepals.

- a. Leaves opposite 1. Urtica
- aa. Leaves alternate.
 - b. Strongly hirsute with stinging hairs 2. Laportea
 - bb. Not stinging; finely puberulent with
 - catchy hairs 3. Parietaria

1. URTICA L.

NETTLE

Stinging herbs with opposite leaves. Sepals and stamens

4.

- a. Tall perennial 1. U. dioica
- aa. Low annual 2. U. urens

1. U. dioica L. var. procera (Muhl.) Wedd. (U. gracilis Aiton; U. Lyallii Watson; U. procera Muhl.; U. viridis Rydb.) -- Stinging Nettle (Ortie) -- Stinging herb with a square stem. Perennial in large colonies, commonly 1 m high. Leaves ovate or cordate below, becoming narrowly lanceolate above, coarsely serrate. All summer. Wetish places.--G, Mack-Aka, L-NF-(SPM), NS-BC, US, Eur.

West of us occurs a more densely pubescent var. californica (Greene) C.L. Hitchcock, the stem and leaves grayish puberulent or densely villous, the pubescence mixed with much longer and stiff hairs.

2. U. URENS L. -- Burning Nettle, Dog-Nettle -- Annual and lower. Leaves all ovate and coarsely serrate. Mid summer to early fall. A weed of gardens and disturbed soils.--(G), Aka, (NF)-SPM, NS-Man, Alta-(BC), US, CA, SA, Eur.

2. LAPORTEA Gaud.

WOOD-NETTLE

Stinging herbs with alternate leaves. Sepals and stamens

5.

1. L. canadensis (L.) Gaud. -- Wood-Nettle (Ortie du Canada) -- Perennial herb with large, round-ovate leaves, remotely alternate below, close together near the summit. Leaves serrate, acuminate. Early summer. Forms large colonies on flood-plains.--SPM, NS, NB-seS, US.

3. PARIETARIA L.

PELLITORY

Non-stinging; the small flower-clusters subtended by overtopping bracts.

- 1. P. pensylvanica Muhl. -- A weak, small and inconspicuous

URTICA

cuous annual herb with a weakly catchy pubescence. Leaves rhomboid-lanceolate, very thin. First half of summer. Dry woods and under isolated clumps of bushes in the prairies.--swQ-BC, US, (Eur).

Not yet reported from Alberta, although we know of 5 or 6 collections, some more than 40 years old.

24. CANNABINACEAE (HEMP FAMILY)

Non-stinging herbs. Calyx reduced to a single sepal. Dioecious.

- a. Self supporting herb; leaves digitate..... 1. Cannabis
 aa. Climber; leaves trilobed 2. Humulus

1. CANNABIS

HEMP

Achene completely enclosed at maturity by an accrescent and long acuminate bract.

1. C. SATIVA L. -- Hemp, Marijuana (Chanvre) -- Tall annual herb with digitate leaves. Dioecious and conspicuously dimorphic in appearance. Lower leaves opposite, the upper alternate. Leaflets 5-9, very narrow, sessile, serrate. Mid summer. Rare weed of cultivation and waste places: Spirit River.--Q-O, Alta, US, Eur.

2. HUMULUS L.

Inflorescence a dense spike of achenes, each subtended by a very large pale green bract.

1. H. Lupulus L. -- Hops (Houblon) -- Herb climbing by its twining and retrorsely scabrous stem. Leaves opposite, deeply and coarsely palmately lobed. Male flowers in loose panicles; female flowers in small panicles of dense spikes. Mid summer. Galerie-forests.--(NF), NS-S-(Alta)-BC, US, Eur.

Order 13. CUNONIALES

Shrubs with inferior or semi-inferior ovary, the sepals partly fused and forming a more or less developed calyx-tube, the free petals inserted at the top of the calyx-tube.

- a. Leaves alternate: flowers pentamerous.
 25. Grossulariaceae
 aa. Leaves opposite; flowers tetramerous.
 26. Hydrangeaceae

25. GROSSULARIACEAE (GOOSEBERRY FAMILY)

Carpels 2, the flower otherwise pentamerous with only 5 stamens. Single genus.

1. RIBES L.

CURRENT, GOOSEBERRY

Shrubs, often spiny, with palmately lobed leaves. Fruit a berry.

- a. Flowers 1-3-(5) in a very reduced raceme.
Mostly spiny 1. R. oxyacanthoides
- aa. Flowers more numerous, in elongate racemes.
 - b. Densely spiny along the internodes.
..... 2. R. lacustre
 - bb. Spineless or with a few nodal spines.
 - c. Ovary and fruit densely stipitate-glandular.
 - d. Leaves coarsely glandular above 9. R. viscosissimum
 - dd. Leaves glabrous or finely puberulent above.
 - e. Ovary (and fruit) abundantly and finely puberulent underneath the glandulosity 3. R. laxiflorum
 - ee. Ovary merely glandular-stipitate 4. R. glandulosum
 - cc. Ovary glabrous or bearing a few sessile glands.
 - f. Leaves dotted below with yellow, resinous glands.
 - g. Pedicels many times longer than the small bracts ..
..... 6. R. hudsonianum
 - gg. Bracts much longer than the short pedicels 7. R. americanum
 - ff. Not glandular-dotted.
 - h. Leaf lobes closely and uniformly serrate from base to tip 5. R. rubrum
 - hh. Leaf lobes with a few coarse teeth above the middle.
 - i. Calyx long tubular; bracts persistent in fruit 8. R. aureum
 - ii. Calyx saucer-shaped; bracts caducous after flowering 10. R. diacanthum

1. R. oxyacanthoides L. var. oxyacanthoides (R. setosum Lindley; Grossularia oxyacanthoides (L.) Miller; G. setosa (Lindley) Cov. & Britt.) -- Wild Gooseberry (Groseillier sauvage) -- Abundantly armed with straight prickles and acicules, the branches often recurved and then forming fierceful tangles. Racemes very short and few-flowered, mostly shorter than the petiole of the subtending leaf. Bracts glandular-ciliate. Flower yellowish white, the tube variable in length. Berry glabrous, pruinose, dark bluish purple. Early to mid spring. Sandy or rocky places.--(K-Mack)-Y, (NF), PEI, (Q)-O-BC, (US) -- Var. saxosum (Hooker) Cov. (R.

hirtellum Mx., var. calcicola Fern., var. saxosum (Hooker) Fern.; R. inerme Rydb.; Grossularia hirtella (Mx.) Spach -- (Fausse épine) -- Bracts long ciliate with glandless hairs; acicules and prickles fewer, weaker and somewhat fugaceous. --L-(NF-SPM), NS-Alta-(BC), US.

2. R. lacustre (Pers.) Poirét (Limnobotrya lacustris (Pers.) Rydb.) -- Swamp-Currant, Swamp-Gooseberry (Groseillier sauvage) -- Like the precedent, with the stem and twigs densely armed with prickles and acicules, but the fruit glandular-bristly. Pedicels glandular. Flower saucer-shaped, greenish to purplish. Fruit purplish black. Late spring. Forests.--Mack-Aka, L-NF, NS-BC, US.

3. R. laxiflorum Pursh -- Quite thornless, but the ovary and fruit both stipitate-glandular and finely puberulent. More or less finely glandular throughout. Flower saucer-shaped, pale green to deep purple. Fruit purplish-black. Late spring. Wet woods.--sAka, (swAlta)-wBC, US.

4. R. glandulosum Grauer (R. prostratum L'Hér.) -- Skunk-Currant, Wild Cranberry (Gadellier sauvage, Castilles) -- Ovary and fruit stipitate-glandular with red glands, but not pubescent. Stems and branches often decumbent. Foliage glabrous to glandular or pubescent. Flowers whitish to roseate, saucer-shaped. Berries red. Late spring. Wet woods. --K-(Mack-Aka, L-SPM), NS-PEI-(NB)-Q-O-(Man-Alta)-BC, (US).

5. R. rubrum L. var. propinquum Trautv. & Mey. (R. triste Pallas) -- Red currant, Wild Currant (Gadellier sauvage) -- The leaves rather squarish and more prominently 3 lobed with 2 other smaller lobes, very wide. Leaves devoid of yellow dots, mostly pubescent below. Racemes finely glandular and puberulent, but the ovary quite glabrous. Flowers saucer-shaped, greenish-yellow, often red-dotted, the small petals often reddish. Early to late spring. Wet woods.--(sk)-sMack, NF, NS-BC, US, Eur -- Var. alaskanum (Berger) Boivin -- Flowers more showy, pink to deep red. -- Mack-Aka, nAlta-BC.

Ribes triste is merely a statistical variation of R. rubrum with the anthers of the latter averaging larger.

6. R. hudsonianum Rich. var. hudsonianum -- Black Currant, Wild Black Currant (Gadellier sauvage) -- Ovary and lower surface of leaves dotted with large clear-yellow glands. Flowers white, tomentose, without a well defined tube. Fruit dull black, with a few yellow glands. Late spring. Wet woods and swamps.--(Mack-Y)-Aka, wcQ-BC, US.

The more western var. petiolare (Douglas) Jancz. is less pubescent and often nearly glabrous. Leaves generally lightly pilose below, rather than puberulent. Raceme denser, the pedicels rather short, mostly shorter than the flowers.

7. R. americanum Miller (R. floridum L'Hér.) -- Black Currant (Gadellier noir) -- Glandular-dotted like the preceding, but the glands reddish or brownish-tinted and present

on both faces of leaf while lacking on the ovary. Flowers whitish green, with a tube about as long as the lobes. The long bracts persistent. Fruit black. Mid to late spring. Ravines and galerie-forests.--NB-Alta, (US).

8. R. aureum Pursh (R. odoratum Wendland f.; Chryso-botrya aurea (Pursh) Rydb.) -- Golden Currant, Buffalo-Currant -- Very showy in mid-spring with its long, golden-yellow flowers with purple center. Glandless and nearly always entirely glabrous. Leaves thickish, all or mostly trilobed and cuneate at base. Raceme with large persistent bracts. Flowers long tubular, the tube about 1 cm long. Fruit red to yellow brown or black brown. Mid spring. Wooded ravines.--swQ-0, S-Alta-(BC), US.

Most authors will distinguish var. grandiflorum Jancz. (=R. odoratum) with longer flowers and somewhat more pubescent. This may be a valid distinction south of our borders, but the Canadian material is mostly intermediate and the distinction is neither significant nor practical in our area. Native with us, it occurs only as an escape from cultivation in other parts of Canada.

9. R. viscosissimum Pursh var. viscosissimum -- Sticky Currant -- Densely covered throughout with stiff and thick glandular hairs. Leaf lobes rounded. Flowers greenish-white to pinkish, the tube well developed, rather large. Berry bluish black. Late spring. Slopes, bluffs and wet woods: Waterton--Alta-BC, wUS.

The fruits are abundantly glandular-stipitate in our var. viscosissimum while they are glabrous or nearly so in the more southern var. Hallii Jancz.

10. R. DIACANTHUM Pallas -- Dioecious. Leaves thickish as in R. aureum and more or less trilobed, or merely obovate and coarsely toothed. Glabrous or nearly so. Sometimes with a pair of small acicules at each node. Flower small, saucer-shaped, greenish, subtended by a long bract which falls off soon after flowering. Berry scarlet, small. Mid spring. Cultivated and more or less naturalized at the edge of an Oak bluff in Brandon.--Man, (Eur).

26. HYDRANGEACEAE (HYDRANGAEA FAMILY)

Carpels 4, also 4 petals and 4 sepals, but numerous stamens.

1. PHILADELPHUS L.

Capsule 4-locular and opening by as many valves.

1. P. Lewisii Pursh -- Mock Orange, Syringa -- Shrub with a short terminal raceme of large, white, opposite flowers. Leaves ovate to lanceolate, entire to coarsely toothed, triple-nerved. Early summer. Hillsides, open to lightly wooded: Waterton.--Alta-BC, US.

We are not quite convinced that this is really different from the more eastern P. coronarius L.

Order 14. ARALIALES

Similar to the Rosales, but the carpels united into an inferior ovary. Sepals fused; petals free; carpels 1-5.

- a. Leaves simple and entire; carpel and style 1..
..... 27. Cornaceae
- aa. Leaves lobed to compound; carpels and styles 2-5 28. Araliaceae

27. CORNACEAE

(DOGWOOD FAMILY)

Shrubs with simple, entire and opposite leaves and white flowers in cymes.

1. CORNUS L.

DOGWOOD

Fruit a one-seeded berry. Stamens and petals 4.

- a. Semi-herbaceous, with verticillate leaves..
..... 1. C. canadensis
- aa. Woody with alternate or opposite leaves.
 - b. Leaves alternate 2. C. alternifolia
 - bb. Leaves all opposite.
 - c. Twigs pale green, mottled with purple 4. C. rugosa
 - cc. Not mottled with purple.
 - d. Branches reddish purple 3. C. alba
 - dd. Branches gray 5. C. racemosa

1. C. canadensis L. var. canadensis (Chamaepericlymenum canadense (L.) A. & G.) -- Pigeon berry, Bunchberry (Quatre-temps, Rougets) -- Inflorescence subtended by 4 large, showy, white bracts. About 1 dm high and forming large colonies. Stem bearing 1-3 pairs of bracts and a verticil of 4 leaves on sterile stems, or 6 leaves on flowering stems. Pubescence rather sparse and malpighiaceous. Early summer. Coniferous woods.--(G), K-Aka, L-SPM, NS-BC, US, Eur -- Var. Dutillyi (Lep.) Boivin -- Upper part of stem and basal part of leaves with dense, crisp pubescence.--(Y-Aka), L, SPM, Q, Man-Alta.

The bracts of the upper pair are sometimes intermediate in size to the leaves of the verticil. This variant is often designated as var. intermedia Farr. or less commonly as the putative hybrid C. uralaschkensis Led. (= C. canadensis X suecica). However, one of the putative parents is absent from our area and the variant appears to be only an infrequent phenotype of sporadic occurrence (Reynolds, Gilham, McKague, La Ronge, Beaverlodge, etc.)

2. C. alternifolia L. f. -- Green Osier -- Similar to the following, the leaves alternate on the leading shoots, subapproximate to subverticillate on flowering shoots. Twigs greenish. Usually a tall shrub with a flattish top. Early summer. Open woods: Prairie Coteau.--NF-SPM, NS-Man, US.

3. C. alba L. var. alba (ssp. stolonifera (Mx.) Wang.; C. sericea AA.; C. stolonifera Mx.; Svida instolonea (Nelson) Rydb.) -- Kinnikinnik, Red Osier (Harts rouges, Poison) -- A common and conspicuous shrub with its dark red twigs. Pubescence malpighiaceous and appressed throughout. Leaves ovate to lanceolate, mostly with 5 pairs of lateral nerves. Inflorescence a flattish corymb, much wider than high. Early summer. Edge of woods and along watercourses.--(K)-Mack-Aka, L-NF-(SPM), NS-(PEI-NB)-Q-Alta-(BC), US, (CA) -- Var. Baileyi (C. & E.) Boivin (C. Baileyi C. & E.) -- Leaves densely soft pilose below with spreading hairs.--Q-Man, (Alta), US -- Var. interior (Rydb.) Boivin -- Not only the lower surface of the leaves, but also the inflorescence and especially the young twigs and the peduncle of the inflorescence, densely spreading-villous to grayish-lanate.--Mack-Y-(Aka, neO-Man)-S-eBC, US.

A report of C. Baileyi by Macoun 1890 from Saskatchewan was based on a collection with the typical pubescence of var. alba. Reports from Alberta have not been investigated.

Cornus alba L., C. stolonifera Mx. and C. sericea L. do not appear to be distinct entities except that the latter has bluish fruits. We have examined the types in 1950. The transfers needed are as follows: C. alba L. f. azurea (Lep.) stat. n., C. stolonifera Mx. f. azurea Lep., Nat. Can. 81: 59. 1954. This blue-fruited form includes C. sericea, the type of which is a flower but the original description stated that the fruit was blue.--C. alba var. Baileyi (C. & E.) stat. n., C. Baileyi Coulter & Evans, Bot. Gaz. 25: 37. 1896. -- C. alba var. californica (Meyer) stat. n., C. californica Meyer, Bull. Phys. - Math. Ac. St. Pet. 3: 373. 1845. -- C. alba var. interior (Rydb.) stat. n., Svida interior Rydb., Bull. Torr. Bot. Club 31: 572. 1904. -- C. alba L. var. occidentalis (T. & G.) stat. n., C. sericea L. var. occidentalis T. & G. Fl. N. Am. 1: 652, 1840.

4. C. rugosa Lam. (C. circinata L'Hér.) -- (Bois de calumet) -- Branches pale green with numerous purple patches. Leaves broadly ovate to nearly round, woolly beneath. Berries blue. Early summer. Wooded ravines.--(NS), NB-sMan, US.

5. C. racemosa Lam. (C. candidissima Marsh.; C. paniculata L'Hér.) -- Quite similar to C. alba, but the leaves tending to be narrower, mostly lanceolate, and with only 3 pairs of lateral nerves. Inflorescence broadly pyramidal, about as high as wide. Early summer. Open woods.--Q-Man, US.

28. ARALIACEAE

(GINSENG FAMILY)

Herbs or semi-woody shrubs, mostly with large compound leaves. Flowers in umbels. Umbels often in racemes or panicles.

- a. Leaf simple 1. Oplopanax
 aa. Leaf compound 2. Aralia

1. OPLOPANAX (T. & G.) Miq.

Carpels 2, styles 2.

1. O. horridus (Sm.) Miq. -- Devil's Club (Bois pi-quant) -- Coarse and very spiny shrub. Stems, branches, petioles, leaves and inflorescence spiny. Leaves very large, palmately lobed, spiny along the nerves. Inflorescence a raceme of umbels. Early summer. Rocky woods: Waterton, Lesser Slave Lake.--Aka, wO, Alta-BC, US.

2. ARALIA L.

Styles and carpels mostly 5.

- a. Stemless 3. A. nudicaulis
 aa. Stem present.
 b. Spineless 1. A. racemosa
 bb. Stem densely spiny below 2. A. hispida

1. A. racemosa L. -- Spikenard, Petty Morrel (Grande Salsepareille, Anis sauvage) -- A large herb with very large leaves, compound of numerous and large leaflets. Stem coarse, up to 2 m high. Umbels in elongate axillary racemes. Deciduous woods.--NS-sMan, US.

2. A. hispida Vent. -- Sarsaparilla, Dwarf Elder (Salsepareille) -- A herb with a semi-woody and densely spiny lower stem. Leaves variable, ternately divided to bipinnate. Umbels terminal and axillary on long peduncles in the upper part of the plant. Mid summer. Rocky openings in coniferous forests.--L-NF, NS-Alta, US.

3. A. nudicaulis L. -- Wild Sarsaparilla (Salsepareille) -- A large basal leaf, mostly with 13 large leaflets. Stemless and stoloniferous, producing numerous scattered large leaves, the sterile ones mostly with 11 leaflets. Inflorescence of 3 umbels on a scape shorter than the petiole. Late spring. Very abundant and almost ubiquitous in coniferous forests.--Mack, NF-SPM, NS-BC, US.

Order 15. BIXALES

Similar to the Rosales, but the carpels (mostly 5) united into a unilocular ovary with parietal placentation. Style 1.

29. CISTACEAE

Petals free. Leaves opposite. Sepals 5, the 2 outer much smaller.

- a. Petals 5.

- b. Flowers of two kinds, the terminal ones with larger petals 1. Helianthemum
 bb. Flowers all alike, all axillary 2. Hudsonia
 aa. Petals 3 3. Lechea

1. HELIANTHEMUM Miller

ROCK ROSE

The two outer sepals very narrow, sometimes lacking. Flowers of two kinds; the terminal ones with 5 fugaceous petals; the others smaller, cleistogamous, with petals minute or wanting.

1. H. Bicknellii Fern. -- Frostweed -- A smallish tenuous shrub, in tufts of a few stems. Leaves variable, those of the stem 2-3 cm long and about lanceolate, those of the branches much smaller. Flowers large, yellow, in terminal racemiform corymbs of 2-15 flowers. Early summer. Open soils, sandy or rocky: La Petite Montagne de Cyprès. --swO-seMan, US.

2. HUDSONIA L.

HUDSONIA

Small shrubs with reduced and closely overlapping leaves, somewhat in the manner of Juniperus horizontalis. Flowers axillary, all alike, all with 5 bright yellow petals.

1. H. tomentosa Nutt. var. tomentosa (var. intermedia AA.) -- Poverty-Grass, Dog's Dinner -- On sand dunes, a very small and very branchy shrub, forming small hemispherical tufts which, seen from a distance, appear blackish. Leaves 1.0-3.5 mm long, lanceolate to linear, lanate. Peduncle short. Petals white at tip. Early summer. Sand dunes and precambrian outcrops. --sMack, L, (NS)-PEI-Alta, US.

Peduncle no longer than the calyx. In the eastern var. intermedia Peck the peduncles are longer, clearly exceeding the leaves and 1-2 times longer than the calyx. The latter is sometimes treated as an interspecific hybrid because it appears to be intermediate to H. ericoides L., but this is not a convincing hypothesis as var. intermedia extends much beyond the common range of the putative parents. This var. intermedia has been reported for lake Athabaska, but all specimens examined (CAN, DAO) for that area turned out to have the shorter pedicels of the typical variety and were revised accordingly.

3. LECHEA L.

PINWEED

Petals 3; sepals 5, of which the outer 2 are very narrow.

1. L. minor L. var. maritima (Leggett) Gray (L. intermedia Leggett) -- A low, tufted shrub, with numerous stiffly erect stems bearing alternate leaves, and numerous

basal offshoots bearing opposite or verticillate leaves. Stem leaves 1.5-2.0 cm long, narrowly lanceolate. Flowers deep red, small. Petals shorter than the sepals. Inner sepals deep red. Outer sepals green, very narrow and slightly shorter than the inner ones. Mid summer. Open, sandy soils.--NS-sMan, US -- Var. depauperata (Hodgdon) Boivin -- Smaller, the stem about 1 dm long and decumbent at base: Lake Athabaska.--S.

Order 16. THYMELEALES

Petals reduced or most often absent. Sepals usually well developed and petaloid, fused into a pseudo-corolla. Ovary mostly reduced to a single carpel.

30. NYCTAGINACEAE (FOUR-O'CLOCK FAMILY)

Calyx persistent and enclosing the fruit at maturity.

Fruit a one-seeded utricle.

- a. Involucral bracts fused into a peltate involucre 1. Mirabilis
- aa. Bracts free; flowers sessile 2. Abronia

1. MIRABILIS L.

FOUR-O'CLOCK

Flowers conspicuous by the petaloid calyx. Petals absent. Flower clusters subtended by a 5-lobed calyx-like involucre of fused bracts. Leaves opposite.

- a. Leaves broadly ovate 1. M. nyctaginea
- aa. Much narrower 2. M. hirsuta

1. M. nyctaginea (Mx.) MacM. (Allionia nyctaginea Mx.; A. ovata Pursh; Oxybaphus nyctagineus (Mx.) Sweet) -- Perennial herb from a large orange-red taproot. Plant glabrous. Leaves ovate or deltoid-ovate. Involucre saucer-shaped, about 1 cm wide, ciliate, becoming larger in fruit. Calyx pink. First half of summer. Open, sandy soils of southern Manitoba, railway embankments elsewhere.--Q-sAlta, US.

2. M. hirsuta (Pursh) MacM. var. hirsuta -- (Allionia hirsuta Pursh; A. pilosa (Nutt.) Rydb.; Oxybaphus hirsutus (Pursh) Sweet) -- Stem lightly to densely long-pilose. Leaves variable, the main ones usually lanceolate and 1 cm wide or larger, often pilose below, abruptly contracted into a short petiole. Glandular-pubescent in the inflorescence. Mid to late summer. Sandy or gravelly prairies and hills. --O-eAlta, US -- Var. linearis (Pursh) Boivin -- (Allionia linearis Pursh; Mirabilis linearis (Pursh) Heimerl; Oxybaphus albidus (Walter) Sweet; O. linearis (Pursh) Rob.) -- Leaves much narrower and gradually attenuate at base, sessile or with a poorly distinct petiole. The grayish-white stem sometimes glabrous, more commonly short-puberulent with curved hairs. Leaves usually puberulent. Mid summer. Arid hillsides.--scMan-sAlta, US, (CA).

2. ABRONIA Juss.

SAND-VERBENA

Involucral bracts free. Flowers sessile.

1. A. micrantha Torrey -- Long tubular flowers, green and yellow in pedunculate glomerules with an involucre of large and free bracts. Somewhat fleshy perennial, puberulent. Leaves opposite, entire, those of the same pair strongly dimegueth. Calyx small but accrescent into a winged fruit 1.5-2.5 long. Wings 2-3. Early summer. Loose alluvial sands, rare: Manyberries Creek.--sAlta, wUS.

Order 17. VIOLALES

Petals and sepals free, but the flower zygomorphous. Single family.

31. VIOLACEAE

VIOLET FAMILY

Ovary with 3 carpels and parietal placentation. Flower pentamerous.

1. VIOLA L.

Herb with the lower petal spurred, thus the flower is a typical Violet. Low herbs. The zygomorphous flowers are reminiscent of the Leguminosae, but there are two upper petals.

- a. Stem present and leaf-bearing Group A
 aa. Stemless; all leaves basal Group B

Group A

Stem present, bearing at least one leaf. Flowers terminating the stem and branches, some may be axillary.

- a. Stipules about as big as the leaf blades and pin-natifid; annuals.
 b. Petals about as long as the sepals or somewhat shorter 2. V. arvensis
 bb. Petals larger, one and a half times to three times as long as the sepals 1. V. tricolor
 aa. Leaf blade many times larger; perennials.
 c. Flowers yellow.
 d. Leaves cuneate to rounded at base ..
 3. V. Nuttallii
 dd. Leaves deeply cordate.
 e. Leaves mostly basal, the stem leaves few and much smaller ..
 4. V. orbiculata
 ee. Stem leaves quite as large and as numerous or more numerous.
 f. Stipules 2-10 mm long .. 5. V. glabella
 ff. Stipules 8-18 mm long ..
 6. V. pubescens
 cc. Flowers white to mauve to blue.

- g. Stipules coarsely dentate 7. V. adunca
 gg. Stipules entire 8. V. rugulosa

Group B

Stemless, all leaves and flowers borne directly on the rhizome.

- a. Leaf deeply divided 9. V. pedatifida
 aa. Entire to shallowly crenate.
 b. Flowers yellow 3. V. Nuttallii
 bb. White to mauve to violet.
 c. Lateral petals bearded at throat; rhizome thick and fleshy 10. V. cucullata
 cc. Rhizome slender and elongate; petals mostly not bearded.
 d. Flowers + mauve.
 e. Leaves strigose above ..
 11. V. Selkirkii
 ee. Foliage glabrous 12. V. palustris
 dd. Flowers white with purple lines.
 f. Leaves reniform, puberulent below 14. V. renifolia
 ff. Leaves broadly cordate-ovate, glabrous below 13. V. blanda

1. V. TRICOLOR L. -- Pansy (Pensée) -- Large-flowered annual with widely spreading petals. Leaves ovate to spatulate, crenate. Flower variously multicoloured, with a yellow center. All summer. Cultivated and casually reseeding itself in and around gardens.--SPM, NS, NB-S-(Alta)-BC, (US), Eur.

2. V. ARVENSIS Murray var. ARVENSIS (V. Kitaibeliana var. Rafinesquii AA.; V. Rafinesquii AA.) -- Field Pansy (Petite pensée, Pensée des champs) -- Quite like the preceding but the yellow flowers much smaller. Stem finely reflexed-pubescent along the angles. Leaves small, ovate to narrowly oblanceolate. Summer, farmed land and sandy soils, uncommon.--(G), NF-SPM, (NS)-PEI-O, S-BC, US, Eur.

All Canadian reports of the glabrous-stemmed var. Rafinesquii Greene appear to be incorrect. The reports from our area were from Tisdale (DAO, SASK) and Edmonton (ALTA; DAO, photo).

3. V. Nuttallii Pursh var. Nuttallii (var. linguifolia (Nutt.) Henry; V. Russellii Boivin; V. vallicola Nelson) -- Densely tufted, yellow-flowered prairie species. Stems variable, often very short. Leaves ovate to narrowly lanceolate, entire or nearly so. Flowers yellow, often reddish to bluish-tinted outside. Early to mid spring. Steppes on hillsides.--Man-BC, US.

The many segregates proposed for this species are mostly morphologically continuous and sympatric, such as broad-

leaved and narrow-leaved forms. Similarly with the phenotype with flowers smaller and not tinged in brown-red dorsally (=var. Bakeri = V. Russellii). However, west of us there is a more distinct var. praemorsa (Douglas) Watson with denser and coarser pubescence, the hairs up to 1 mm long or more on the petioles.

4. V. orbiculata Geyer -- Stem leaves 1-3, much smaller than the rosette leaves. Perennial with fleshy taproot. Foliage glabrous. Leaves roundish, deeply cordate. Stem bearing a single terminal flower. Petals pale yellow, purple-lined, the lateral minutely bearded. First half of summer. Moist mountain woods.--(Alta-BC, US).

5. V. glabella Nutt. -- Much like the following, the stipules smaller, the rhizome somewhat thicker and more elongate, the leaf serrations mostly smaller and more numerous, the leaf tip less broadly acuminate. Late spring to early summer. Wet woods in Waterton.--Aka, Alta-BC. US.

6. V. pubescens Aiton var. leiocarpa (Fern. & Wieg.) Boivin (V. eriocarpa AA.) -- Yellow Violet -- A forest species with yellow flowers. Stem usually leafless below the middle. Leaves cordate to reniform, mostly deltoid, crenate-serrate, becoming very large. Late spring. Common in Oak woods.--NS-sMan, US.

All Manitoba specimens examined turned out to belong to the glabrous-fruited var. leiocarpa.

The separation of Viola pubescens and V. eriocarpa Schwein. as proposed in current manuals is not satisfactory. This was clearly expressed by C.C. Deam, Flora of Indiana, p. 691. 1940. Quote:

"V. eriocarpa ... Most of our specimens are more pubescent than the typical form, in fact many so closely approach V. pubescens that it seems wrong to place them with this species".

"V. pubescens ... The separation of this species from the preceding is not at all satisfactory. The characters used in their separation are not constant and it appears from my specimens that all characters fail about equally, so that a preponderant character is absent."

He expressed our own experience quite clearly. The character of pubescence is not realistic, intermediate specimens being more numerous than the typical ones.

The character of presence or absence of basal leaves has only a statistical value. Standing in any one colony, it is obvious that it belongs to one type or the other, but a minority of 10-30% of individuals plants will be atypical. Herbarium specimens are not always carefully collected and are rarely numerous enough on any one sheet to carry over the statistical value of this character.

Distinctions based primarily on the above two characters result in entities of roughly the same distribution.

The character of glabrous vs. lanate ovary or fruit is

normally treated as a subsidiary one, but this turned out to be without intermediates and to be clearly restricted geographically.

When the emphasis was shifted and the pubescence of the ovary was made the main character while the other characters were treated as subsidiary, a new picture emerged that was far different, quite sharp and far more satisfactory than any other previous classification. This may be expressed as follows:

Var. pubescens; V. pubescens Aiton 1789; V. pennsylvanica Mx. 1803; V. eriocarpa Schwein. 1823. Ovary and fruit white lanate. Basal leaves mostly absent, more rarely 1-3. Herbage commonly heavily pubescent, varying to nearly glabrous. Restricted in Canada to southern Ontario, the Ottawa valley, the Monteregian Hills and the Richelieu Valley; isolated at Sault-Sainte-Marie and the Grosse Ile in the estuary of the Saint-Lawrence river. In the U.S.A., south to Alabama.

Var. leiocarpa (Fern. & Wieg.) stat. n., V. eriocarpa Schwein. var. leiocarpa Fern. & Wieg., *Rhodora* 23: 275. 1921; V. pubescens Aiton var. scabriuscula T. & G. f. leiocarpa (Fern. & Wieg.) Farwell 1923; V. pubescens Aiton var. Peckii House 1923. Ovary and fruit glabrous. Basal leaves 1-3 per tuft, rarely none. Herbage pubescence variable. Widely ranging in Canada from the Pembina Hills of southern Manitoba eastward to the Gaspé peninsula and Nova Scotia. South to North Carolina.

We have adopted the rank of variety for these taxa and it is worth pointing out that var. leiocarpa is a good example of the difference between a variety and a species as it is just barely short of the minimum morphological discontinuity essential to a species. This minimum is of two linked characters, but var. leiocarpa exhibits only one clearly defined character, the other being only partially linked.

7. V. adunca Sm. (var. minor (Hooker) Fern.; V. arenaria AA.; V. conspersa Rchb.; V. subvestita Greene) -- Densely tufted caulescent species with blue flowers. Stems all or mostly spreading. Foliage more or less pubescent, becoming glabrous. Leaves ovate, finely crenate. Lateral petals long-bearded. Ovary glabrous. All spring. Common in dry to wet, open habitats.--G, K-Aka, L-SPM, NS-BC, US. -- F. Masonii (Farw.) Boivin (f. albiflora Vict. & Rouss.) -- Flowers white. Local.--NS, Q-O, S-(Alta, US).

8. V. rugulosa Greene (V. canadensis AA.) -- Long stoloniferous forest species, forming large open colonies or carpeting the forest floor. Rhizome thin and fragile, but thickened near the base of the stem. Leaves villous, the lower and basal broadly reniform, the upper subopposite and more or less cordate. Flowers mauve. Lateral petals long-bearded. Capsule finely puberulent. Late spring

to mid summer. Ubiquitous in Aspen groves.--Mack, wO-BC, US.

As pointed out by Boivin 1948, V. canadensis L. is a strictly eastern species and all western material of the group belongs to V. rugulosa. Most western authors have reported both species as occurring in our area and some of them, finding the distinction difficult to establish, have quite understandably expressed some doubt as to the value of V. rugulosa. If western collections are compared only with eastern ones, the morphological distinction is reasonably satisfactory, even if the two species are obviously closely related. The differences may be contrasted as follows.

V. canadensis -- Tufted and many-stemmed. Rhizome short, thick, ascending, branched. Not stoloniferous. Herbage glabrous to lightly puberulent. Leaves cordate, about $1\frac{1}{2}$ times as long as large, the summit acute-acuminate. Sepals 7-10 mm long.

V. rugulosa -- Stems solitary, rarely in 2's. Long stoloniferous, the stolons thin but becoming thicker just below the base of the stem. Forming extensive colonies of mostly single stems. Leaves larger, reniform-cordate, about as long as large, more abruptly short acuminate. Sepals shorter, 4-7 mm long.

9. V. pedatifida G. Don -- Prairie-Violet -- Leaves pedatipartite. Flowers large, very showy, reddish purple. Lateral petals densely long-bearded. Late spring. Sandy prairie.--sMan-Alta, US.

10. V. cucullata Aiton (V. nephrophylla Greene, var. cognata (Greene) C.L. Hitchc.; V. sororia W.) -- Tufted species with broadly cordate leaves and large blue flowers. Rhizome thick, short, ascending. Foliage glabrous to villos, the leaves with a broadly open basal sinus. Flowers 1.5-2.0 cm long, the spur about 3 mm long. All petals long-bearded at the throat, or the upper two glabrous. Late spring to early summer. Shores and other open, wet places.--K-(sMack), NF-(SPM), NS-BC, US, (CA)-- F. albiflora Britton -- Flowers white. Rosthern.--Q-O, S, (US).

11. V. Selkirkii Pursh -- Similar to V. cucullata, but generally smaller, with the flower 1.0-1.5 long, and a rather long spur, about 5 mm long and at least $\frac{1}{3}$ as long as whole flower. Rhizome thin and elongate. Leaves lightly strigose above, glabrous below, the basal sinus narrow, nearly closed. Petals pale bluish violet, not bearded. Late spring. Deep, wet woods.--(G), K, (Y-Aka, L-NF, NS, NB-Q)-O-Alta-(BC, US, Eur).

12. V. palustris L. -- Marsh-Violet -- Rosettes poorly developed, most leaves being alternate on the long thin stolons; this species thus forming a carpet. Plant glabrous. Leaves reniform, deeply cordate. Flower mauve or pale violet, 12-13 mm long including the short spur. All petals glabrous or the lateral ones minutely papillate. Late

spring. Wet woods.--(G), K-(Mack-Y)-Aka, L-(NF), Q-(O)-Man-
(S-BC, US, Eur) -- F. albiflora Neum. (var. brevipes (M.S.
Baker) Davis) -- Local form with white flowers.--(NF), Alta-
(BC, US).

13. V. blanda W. (V. pallens (Hanks) Brainerd) -- White
Violet, White Saxifrage, Mayflower -- Tufted, with long,
leafless stolons. Leaves broad-ovate to round reniform,
lightly pubescent above to glabrous. Flower 8-12 mm long,
with deep purple lines, the spur short. Petals beardless
or the lateral bearded. Early spring. Moist, rich woods.
--(K-Aka), L-NF-(SPK, NS-PEI)-NB-nMan, swAlta-BC, US.

14. V. renifolia Gray (var. Brainerdii (Greene) Fern.)
-- Tufted species with reniform leaves and white flowers.
Foliage pubescent to nearly glabrous. Flowers with deep
red lines, small, about 8 mm long including the short spur.
Petals beardless. Mid spring to mid summer. Wet coniferous
woods.--K-(Mack-Aka, L-NF), NS-(PEI-NB)-Q-BC, US.

Order. 18. POLYGALACTALES

Flowers more strongly zygomorphic than in the Violales
and with some reduction or fusion of floral parts.

32. POLYGALACTACEAE (MILKWORT FAMILY)

Only one genus with us, easily recognized by its unu-
sual type of zygomorphic flower.

1. POLYGALA L. MILKWORT

Sepals 5, free, persistent in fruit, the inner ones
(termed wings) larger and petaloid. Petals reduced to 3,
partly fused at base, the lower one (termed keel) larger
and crested dorsally. Stamens 6 or 8, their filaments united
into an incomplete tube and partly fused with the petals.
Ours are low herbs.

a. Leaves verticillate 4. P. verticillata
aa. Leaves alternate.

b. Leaves elliptic or ovate 1. P. paucifolia
bb. Much narrower.

c. Leaves linear, 1-2 mm wide 3. P. alba
cc. More or less lanceolate and 2-5 mm broad
or wider 2. P. Senega

1. P. paucifolia W. (P. pauciflora sphalm.) -- Flower-
ring Winter-green, Bird-on-the-Wing -- Stem merely bracte-
late below, with a few large leaves above and a few rather
large and showy pink flowers. Wings 1.5 cm long, about as
long as the corolla. Stamens 6 (all others have 8). Late
spring and early summer. Rich woods on light soil.--NB-ecS,
US.

2. P. Senega L. var. Senega (var. latifolia AA.) --
Snakeroot (Seneca) -- Leaves alternate, but the uppermost

opposite or verticillate, narrowly lanceolate, rarely over 1 cm wide, finely denticulate, the teeth barely 0.1 mm long. Densely tufted perennial with the upper leaves gradually larger. Raceme dense, whitish. Early summer. Black soils, mostly around Aspen groves.--NB-Alta, US.

Var. latifolia T. & G. has larger leaves, the upper lanceolate to ovate-lanceolate, the larger ones up to 1.5-2.5 cm wide, the denticulation not quite so fine, the teeth often + 0.3 mm long. Fruit tending to be larger. This var. latifolia is more southern and barely enters Canada in southwestern Ontario. Intermediates are however widely distributed, especially in southern Manitoba and southwestern Quebec. A previous report for Saskatchewan was based on such an intermediate.

3. P. alba Nutt. -- A rather sparse herb. Leaves all alternate, very narrow, the uppermost smaller. Raceme whitish. First half of summer. Eroded coulées.--sS, US.

4. P. verticillata L. (var. isocycla Fern.) -- Another sparse herb with the leaves disposed in a few distant verticils. Tufted and branched above. Raceme whitish. Second half of summer. Steppes on hillsides.--soQ-sMan, US.

Order 19. CUCURBITALES

Mostly herbs climbing by tendrils. Flowers unisexual and the ovary inferior.

33. CUCURBITACEAE (GOURD FAMILY)

One stamen with only 1 locule, the other 1-4 stamens with 2 locules. Sepals and petals more or less fused.

a. Leaf minutely denticulate 1. Thladiantha

aa. Leaf lobed.

b. Leaf deltoid, irregularly lobed 2. Bryonia

bb. Leaf palmately and deeply 5-lobed... 3. Echinocystis

1. THLADIANTHA Bunge

Flowers solitary in the axils.

1. T. DUBIA Bunge -- Golden Creeper -- Leaves large, broadly ovate-cordate, scabrous, the nerves excurrent into minute marginal teeth. Perennial from a globose corm. Stems long hirsute. Flowers yellow, large, campanulate, with reflexed sepals. Mid summer to the first frosts. Cultivated and weedy in gardens, roadsides and dumps: Brandon --swQ-sMan, (US, Eur).

2. BRYONIA

Staminate flowers in racemes; pistillate flower solitary or in small clusters.

1. *B. DIOICA* L. -- Bryony, Cow's Lick (Bryone, Navet bêtard) -- Tendrils simple. Leaf \pm deltoid, coarsely and irregularly toothed to deeply lobed, very scabrous. Perennial from a carrot. Flowers greenish-white, about 1 cm long. Fruit a berry less than 1 cm across. (Early summer?). Cultivated as ground cover and rarely weedy or long persistent in and around gardens: Altona.--aMan, Eur.

3. *ECHINOCYSTIS* T. & G.

Fruit covered with numerous soft spines. Male flowers in panicles; female flower solitary.

1. *E. lobata* (Mx.) T. & G. (*Micrampelis lobata* (Mx.) Greene) -- Wild Cucumber, Balsam Apple (*Concombre sauvage*, *Concombre rameur*) -- Annual with huge and persistent cotyledon leaves. Leaf palmately 5-lobed, the terminal lobe larger, the basal ones much smaller. Fruit pale green, soft and juicy, 2-locular with 4 seeds. Mid summer. Scrambling over the floodplain vegetation; cultivated and readily escaping to brush piles.--NS-BC, US.

Native from N.B. to Sask., escaped elsewhere.

Order 20. *CACTALES*

Petals and stamens very numerous and free over an inferior ovary.

34. *CACTACEAE* (CACTUS FAMILY)

Very fleshy and ferociously spiny. Leaves vestigial and fugaceous. The enlarged stem is the fleshy part.

- a. Globular 1. *Mamillaria*
 aa. Elongate and made up of a series of articles..
 2. *Opuntia*

1. *MAMILLARIA* Haw.

Globular and covered with crowded nipple-like protuberances, each of which is topped by a rosette of spines.

1. *M. vivipara* (Nutt.) Haw. (*Neomamillaria vivipara* (Nutt.) Britton & Rose.)-- Purple Cactus, Ball-Cactus -- Just about like a pin cushion and around 5 cm across. Sometimes tufted and forming a half sphere of pin cushions. Flower purple-red, open in the morning only. Early summer. Top of dry hills.--swMan-sAlta, US.

2. *OPUNTIA* Miller PRICKLY PEAR

The fleshy stem constricted into a series of jointed articles. Spines in clusters over the surface of the article.

- a. Articles 1-3 cm long 1. *O. fragilis*

aa. Articles much larger 2. O. polyacantha

1. O. fragilis (Nutt.) Haw. -- Cactus, Prickly Pear (Crapaud vert) -- Much like the following, but generally smaller and the articles only slightly compressed, readily detaching themselves to become attached to the skin and fur of animals. Spines apparently catchy. The terminal and flower-bearing article often much larger than the others. Early summer, rarely flowering. Steppes, especially near the base of hills.--O-BC, US.

Occurs as far north as 56°N, on the sunny south-facing slopes of the coulée of the Peace River.

2. O. polyacantha Haw. -- Cactus, Prickly Pear (Raquette, Corne de raquette) -- Articles 5-11 cm long, broadly flattened, orbicular to broadly obovate. Spines ivory to bright red. Flower large and showy, shining yellow with a red center, fading red. First half of summer. Dry steppes, mostly on hills.--sS-sBC, US.

More southern than the first, and all reports for the Peace are probably based on misidentification of O. fragilis.

All Manitoba collections examined turned out to be O. fragilis. Presumably other collections cited for the province should be similarly revised.

Order 21. TILIALES

Trees or shrubs with a rather typical flower of free sepals and petals, stamens also usually free, but the carpels fused into a superior ovary.

35. TILIACEAE

(LINDEN FAMILY)

A primitive type with pentamerous flowers and numerous stamens.

1. TILIA L.

BASSWOOD

Rachis of the inflorescence fused to the back of a large bract which acts like the wing of a samara.

1. T. americana L. (T. glabra Vent.) -- Basswood, Whitewood (Bois blanc) -- Tree with round, cordate and asymmetrical leaves, abruptly short-acuminate, serrate, palmately nerved, glabrous to stellate-pubescent. Bract oblanceolate, entire. Flowers greenish yellow. Just before mid-summer. Galerie-forests of southern Manitoba; sometimes planted and naturalized at Moose Jaw.--NB-S, US.

The pubescence is rather variable on the lower face of the leaves and some authors will distinguish a glabrous or near glabrous type (= T. americana or T. glabra) and a pubescent or velvety type (T. neglecta Spach). Both occur in our area and are sporadic throughout the Canadian part of the range. They obviously represent an arbitrary dis-

inction of extreme phenotypes within a morphological continuum.

Order 22. MALVALES

Much as in the Tiliales, but the numerous stamens fused into a tube around the style. Single family. Ours all herbs.

36. MALVACEAE

(MALLOW FAMILY)

Sepals fused below. Petals 5, free. Carpels united into a ring.

- a. Calyx without bractlets; leaves entire or nearly so 1. Abutilon
- aa. Calyx usually subtended by 2-9 bractlets; leaves shallowly to deeply divided.
 - b. Bractlets more than 5.
 - c. Flowers in a terminal inflorescence. 4. Althaea
 - cc. Axillary and solitary 7. Hibiscus
 - bb. Only 3 or sometimes less.
 - d. Leaves palmatipartite 2. Sphaeralcea
 - dd. Not so deeply lobed.
 - e. Flowers in axillary racemes 6. Iliamna
 - ee. Mostly in axillary clusters or solitary.
 - f. Bractlets fused 3. Lavatera
 - ff. Bractlets free 5. Malva

1. ABUTILON Miller

INDIAN MALLOW

Calyx not bracteolate. Fruit a ring of numerous dehiscent follicles.

1. A. THEOPHRASTI Med. -- Velvetleaf, Pie-Marker (Mauve jaune, Mauve des Indes) -- Large annual herb, soft velvety-pubescent throughout, with large cordate leaves, entire or nearly so. Flower variable in size, yellow. Fruit of 10-15 large carpels, each with a spreading beak. Mid summer to fall. Casual weed of gardens and disturbed soils: Brandon, Biggar.--(NS)-PEI, Q-S, US, (Eur).

Also reported from B.C. by Groh 1944, but the justifying specimen was not preserved and the report remains essentially unverifiable, although it is not an improbable one.

2. SPHAERALCEA St.-Hilaire

FALSE MALLOW

Calyx normally with about 3 bracts, but these usually lacking in our only species. Carpels of two kinds: the upper dehiscent and sterile, the lower indehiscent and seed-bearing.

1. S. coccinea (Pursh) Rydb. (Malvastrum coccineum (Pursh) Gray) -- Moss-Rose -- Densely stellate-pubescent perennial prairie-herb with conspicuous scarlet flowers. Leaf compound or deeply divided into about 5 lobes, the lobes entire to more or less divided. Flowers in a terminal raceme. Late spring and summer. Steppes and prairies, flowering more readily around gopher holes.--Man-BC, US.

3. LAVATERA L.

Calyx with 3 large fused bracts.

1. L. THURINGIACA L. -- Gay Mallows -- Flowers solitary and long-peduncled in the axils of the upper, reduced leaves, forming terminal pseudoracemes. Densely stellate-pubescent. Around 1 m high. Leaves palmately lobed, serrate. Calyx large, the double calyx almost as large. Flowers rose, about 6 cm across. First half of summer. Rare adventive. Minnedosa, Maidstone.--NB-S, Eur.

4. ALTHAEA L.

Calyx very obviously double, being formed of 5 sepals fused at base and subtended by a verticil of 6-9 bractlets also fused at base. Fruit as in Malva.

1. A. ROSEA Cav. -- Hollyhock (Passerose, Rose trémière) -- Very showy and tall virgate herb with very large flowers in a long, terminal, racemiform inflorescence. Leaves polygonal to palmatifid, crenulate. Bractlets and sepals nearly similar. Petals variable, mostly polychrome. Second half of summer. A popular ornamental, rarely spontaneous around dumps and waste places: Pilot Mound.--swQ-sMan, (US), Eur.

5. MALVA L.

MALLOW

Bractlets 3, free. Carpels numerous, indehiscent, one-seeded. The fruit breaking up into a ring of achenes at maturity.

a. Petals 1.5-3.0 cm long.

b. Flowers in axillary clusters 1. M. sylvestris

bb. Mostly in a terminal corymb 6. M. moschata

aa. Flowers smaller.

c. Stem erect; leaves very crisp-margined.

..... 2. M. verticillata

cc. Stem becoming decumbent to trailing.

d. Petals 2-3 times as long as the calyx.

..... 5. M. neglecta

dd. Smaller, about as long as the calyx.

e. Calyx up to 1 cm wide; fruit 5-6 mm

across 3. M. rotundifolia

ee. Calyx becoming larger, its lobes

broader; fruit larger 4. M. parviflora

1. *M. SYLVESTRIS* L. var. *MAURITIANA* (L.) Boiss. -- High Mallow (Mauve d'Alger) -- Coarse annual herb, up to 1 m tall. Leaf glabrous, palmately veined and lobed, the lobes shallow, round and crenate. Bractlets 3, obovate, free from the calyx. Petals bluish purple. Summer. Showy but uncommon garden weed.--Q-Alta, (US, Eur).

In the typical var. *sylvestris* the herbage is long hirsute and the leaf lobes are most often triangular or oblong.

2. *M. VERTICILLATA* L. var. *CRISPA* L. (*M. crispa* L.) -- Curled Mallow (Mauve frisée) -- Annual herb with large and heavily crisped leaves. Up to 1.5 m tall. Leaves crenately lobed, finely serrate, somewhat hirsute with simple and stellate hairs. Bractlets 3, narrowly lanceolate, free from the calyx. Petals white to mauve, about twice as long as the calyx. Mid to late summer. Sometimes cultivated and casually escaped or reseeding itself.--PEI-Alta, (US, Eur).

In the typical var. *verticillata* the leaves are not crisp along the margin.

3. *M. ROTUNDIFOLIA* L. (*M. borealis* Wallr.; *M. pusilla* Sm.) -- Dwarf Mallow (Petite Mauve) -- Leaves nearly round and broadly crenate, serrate, deeply cordate. Herbage hirsute to stellate-pubescent. Very branchy and more or less decumbent or trailing. Flowers in axillary clusters of 2-5. Bractlets 3, very narrow, partly adnate to the base of the calyx. Petals white to pale mauve, about as long as the calyx. Calyx up to 1 cm wide, often glabrous dorsally, hirsute-ciliate with hairs about 1 mm long, the lobes triangular or deltoid. Fruit 5-6 mm wide. Carpels with sharp edges, strongly reticulate on the back. Summer and fall. Common weed of disturbed soils, especially of tramped places; frequent in farmyards and towns.--PEI-BC, US, (CA), Eur.

4. *M. PARVIFLORA* L. -- Closely similar to the last. Calyx enlarging in fruit up to 10-(15) mm, ciliate and pubescent dorsally with hairs less than half as long as in the last, the lobes at first overlapping and narrowed at base, becoming 2-3 times wider than long in fruit. Fruit 7-8 mm across. Carpels similar, but the sharp edge produced into a narrow and scalloped wing. Summer. Rare weed: Quinton, Craven, Sunny Brow.--(Q), S, (BC), Eur.

Reported by Moss 1957 for Alberta but we know of only one collection from that province, McCalla 11223, Calgary, 1950 (DAO) and this was correctly revised to *M. pusilla* (= *M. rotundifolia*) by Dr. C. Frankton in 1955.

5. *M. NEGLICTA* Wallr. -- Cheese, Cheeseweed (Amour, Fromage) -- Quite similar to the last two, but the flowers larger. Petals about 12 mm long, mostly mauve. Carpels not reticulate, but short-velvety on back and rounded on the edges. Late spring to fall. Rare town weed: Notre-

Dame-de-Lourdes.--NF, NS, NB-Man, BC, US, Eur, (Afr).

All other reports from Manitoba and all reports from Saskatchewan were apparently based on specimens of M. rotundifolia, while the Alberta entry was a mere speculative listing.

6. M. MOSCHATA L. -- Musk-Mallow (Mauve musquée) -- Leaf palmatipartite, the segments pinnatifid, the lobes linear. Basal leaves less divided. Herbage lightly hirsute with simple hairs, or sometimes with stellate hairs on the calyx. Petals 2-3 cm long, mostly mauve. Summer. Cultivated and locally escaped to waste places or disturbed soils: Saint-Norbert.--NF, NS-Man, BC, US, Eur.

6. ILIAMNA Greene

Similar to Malva, but the carpels 2-4 seeded and dehiscent at maturity. Bractlets 3, free.

1. I. rivularis (Douglas) Greene -- Wild Hollyhock, Mountain-Hollyhock -- Tall, virgate, maple-leaved herb with pink flowers. Tufted perennial, about 1 m high. Leaves large, palmately veined and lobed, serrate to doubly serrate. Flowers pink, in axillary clusters and a terminal raceme. Petals about 2 cm long. Summer. Wet woods along creeks, also ditches.--swAlta-BC, US.

7. HIBISCUS L.

ROSE MALLOW

Carpels only 5, becoming a loculicidal capsule at maturity. Bractlets numerous, free.

1. H. TRIONUM L. -- Flower-of-an-Hour, Modesty (Fleur d'une heure, Oeil de faisan) -- Calyx very large, pale green with deep purple nerves. Annual, stellate-hirsute herb. Leaves tripartite to almost trifoliate, the lower sometimes palmatipartite. Petals large, pale yellow, darker along one edge, with a large purple patch at base. Summer. Rare garden weed.--(NS-PEI)-NB-S, US, Eur.

Order 23. EUPHORBIALES

Flowers imperfect and more or less reduced. Single family.

37. EUPHORBIACEAE

(SPURGE FAMILY)

Represented with us by a single genus characterized by its highly specialized and flower-like inflorescence termed a cyathium.

1. EUPHORBIA L.

SPURGE

Perianth absent, the male flower reduced to a stamen, the female flower reduced to its ovary. Cyathium composed of 4-5 fused bracts, mostly bearing a gland and a petaloid appendage, plus numerous single stamens, plus a single ovary, short stipitate and often exserted. Herbs with milky juice.

- a. Leaves alternate below, opposite to verticillate above.
 - b. Upper leaves and bracts with a broad, white margin 6. E. marginata
 - bb. Leaves green.
 - c. Leaves serrulate 1. E. Helioscopia
 - cc. Entire.
 - d. Stem leaves ovate 5. E. Peplus
 - dd. Linear to lanceolate.
 - e. Stem leaves broadly cordate at base 4. E. lucida
 - ee. Attenuate at base.
 - f. Bearing densely leafy, sterile branches above.
 - 2. E. Cyparissias
 - ff. Stem simple or bearing only floriferous branches from the upper axils E. Esula
 - aa. Leaves all opposite.
 - g. Leaves entire 7. E. Geyeri
 - gg. Denticulate 8. E. serpyllifolia

1. E. HELIOSCOPIA L. -- Wartweed, Sun-Spurge (Réveil-le-matin) -- Leaves serrulate. Stem leaves alternate, spatulate. Inflorescence leaves obovate, asymmetrical, verticillate in 3's, with the outer two much larger. Summer. Occasional garden weed: Pleasantdale, etc.--SPW, NS-C, S-BC, US, Eur.

2. E. CYPARISSIAS L. -- Cypress-Spurge, Irish Moss (Rhubarbe des pauvres, Petit cyprès) -- Upper part of stem bearing sterile and densely leafy branches, which may become flower-bearing late in the season. Stem leaves 1-2 cm long, alternate, linear, 1-3 mm wide. Inflorescence subtended by a verticil of numerous leaves. Inflorescence leaves deltoid, opposite. Late spring to late summer. Cultivated and rarely spreading to dry open places.--NF, NS-Man, BC, US, Eur.

3. E. ESULA L. (E. virgata Waldst. & Kit.; Galorrhoeus Esula (L.) Rydb.) -- Leafy Spurge, Wolf's Milk (Embranchée) -- Like the preceding, but larger and devoid of sterile branches, or the branches leafy in the same manner as the stem. Leaves mostly much larger, mostly long attenuate at base. Inflorescence leaves very broadly deltoid and yellowish green. Late spring to fall. Agressive weed of disturbed soils, sometimes invading the prairie.--NS-PRI, S-BC, US, Eur.

We are not convinced that E. virgata (or E. intercedens Posp., or E. uralensis Fischer) is a tenable segregate; its diagnostic characters are not realistic, at least as far as the specimens examined are concerned.

4. E. LUCIDA Waldst. & Kit. (Galorrhoeus lucidus

(Waldst. & Kit.) Rydb.)-- Much like the preceding, but the leaves still larger, 1-2 cm wide, triangular-lanceolate and cordate at base, sessile. Inflorescence leaves about semi-circular. Summer. Locally naturalized.--(O), S-Alta, (US, Eur).

Gleason 1952 (and Croizat 1945) would rather place our plants in E. agraria Bieb., but we are not convinced that this is a tenable segregate.

5. E. PEPLUS L. -- Petty Spurge, Wild Caper -- Stem leaves obovate with thin petioles, alternate, the terminal verticil: 3 or 4 leaves. Inflorescence elaborate, dichotomously branched, with oval, opposite, sessile leaves. Summer and fall. Local weed of gardens and waste places.--Aka, NF-SPM, NS-S, BC, US, Eur.

Known only from Morden and Wallwort. The reports from Winnipeg and Boissevain are apparently based on a misreading of Groh 1950.

6. E. MARGINATA Pursh -- Snow-on-the-Mountain, Ghost-Weed -- A showy herb because of the broad white margins of the inflorescence leaves. Stem leaves fleshy, alternate, ovate to lanceolate. Inflorescence villous, subtended by a verticil of 3-(4) leaves. Late summer. Cultivated and casually reseeding itself. Otterburne, Saint-Norbert.--O-sMan, US.

7. E. Geyeri Eng. -- Similar to next, but the leaves entire. Appendages small, white, inconspicuous. Seeds mauve, nearly smooth, round-triangular. Mid to late summer. Pioneer on sand drifts: Saint-Claude, Saint-Lazare, Grande-Clairière.--swMan, US.

8. E. serpyllifolia Pers. (E. glyptosperma Eng.; Chaemesyche glyptosperma (Eng.) Small; C. serpyllifolia (Pers.) Small) -- Prostrate to erect annual herb, abundantly and somewhat dichotomously branched. Leaves all opposite, 0.5-1.5 cm long, broadly to narrowly oblong, strongly inequilateral, minutely serrulate, especially towards the tip, not spotted, more or less reticulate, often with a large purple patch in the center. Cyathium small, axillary, solitary, with small appendages. Seed quadrangular with sharp angles, smooth to transversely corrugate, gray to brown-red. Summer. Sandy and gravelly places.--nNB-BC, US, (CA).

Usually subdivided into two species: E. serpyllifolia with seeds smooth or nearly so, and E. glyptosperma with seeds ridged transversally. Both types are equally frequent and sympatric in Canada and intermediates are common; the value of the distinction, if any, is not obvious to us.

Order 24. GUTTIFERALES

Single family and genus with us. Leaves opposite.

38. HYPERICACEAE (ST. JOHN'S-WORT FAMILY)

Flowers perfect with the numerous stamens often fused in 3 or 5 clusters.

CONTRIBUTION TO THE BRYOPHYTES OF THAILAND, II.

Clyde F. Reed* and Harold Robinson**

This paper gives the results of a review of collections of bryophytes sent to the senior author from the Botanical Section of the Department of Agriculture, Bangkok, Thailand. The specimens have been identified by the junior author. The original specimens, many collected for the project "Flora of Thailand", are in the herbarium of the Botanical Section of the Department of Agriculture in Bangkok, Thailand. Duplicates are in the United States National Herbarium, Washington, D.C. and/or in the Reed Herbarium, Baltimore, Maryland.

The following list includes 3 species of Hepaticae and 49 species of Musci. Ecological data in regard to habitat are included where available.

HEPATICAE

Lophocoleaceae

Chiloscyphus argutus Nees Doi Sutep, Chiangmai, c. 1100 m. on rock in running water. Mar. 23, 1965. C.Chernsivathana 18 and 19.

Frullaniaceae

Frullania tenuicaulis Mitt. Pilock, Kanburi, c. 1000 m., common on wet rock. Feb. 24, 1967. C.Chernsivathana 704.

Lejeuneaceae

Lejeunea riparia Mitt. Doi Sutep, Chiangmai, c. 1100 m., on surface of rocks near running water. Mar. 23, 1965. C.Chernsivathana 21.

MUSCI

Fissidentaceae

Fissidens nobilis Griff. Doi Sutep, Chiangmai, on dry surface of rock. Mar. 23, 1965. C.Chernsivathana 17.

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Fissidens sylvaticus Griff. Hui Yang, Prachuap, on wet soil in evergreen forest. Oct. 24, 1964. C.Chermsirivathana 12.

Ditrichaceae

Garckea comosa (Doz. et Molk.) Wijk et Marg. (G. phascoides (Hook.) C.Mull.). Pilock, Kanburi, c. 1000 m., on wet ground, with Pogonatum junghuhnianum and Dicranella brasiliensis. Feb. 24, 1967. C.Chermsirivathana (710); Kao Yai, Saraburi, on ground in evergreen forest, with Dicranella brasiliensis. Oct. 14, 1964. C.Chermsirivathana 7a.

Wilseniella pellucida (Wils.) C.Mull. Kaoyai, Nakorn-nayok, c. 600-700 m., on bare soil along road. Mar. 17, 1965. Kasem 432.

Dicranaceae

Campylopus ericoides (Griff.) Jaeg. Doi Pui - Doi Sutep, c. 1600-1100 m., on rocks in evergreen forest. Mar. 25, 1965. C. Chermsirivathana 32.

Campylopus gracilis (Mitt.) Jaeg. Doi Pui, c. 1600 m., on bark of tree trunk in evergreen forest. Mar. 25, 1965. C.Chermsirivathana 23.

Dicranella brasiliensis (Dub.) Bartr. Kao Yai, Saraburi, on ground in evergreen forest, with Garckea comosa. Oct. 14, 1964. C.Chermsirivathana 7; Pilock, Kanburi, c. 1000 m., on wet ground, with Garckea comosa and Pogonatum junghuhnianum. Feb. 24, 1967. C.Chermsirivathana 710.

Dicranella (Microdus) miquelianus (Mont.) Jaeg. Kaokheo, Nakorn-nayok, c. 1100 m., growing on fine sandy soil. Mar. 21, 1965. Kasem 500.

Holomitrium griffithianum Mitt. Doi Pui - Doi Sutep, c. 1600-1100 m., on tree trunk in evergreen forest, with Macromitrium sulcatum and Brachymenium nepalense. Mar. 25, 1965. C.Chermsirivathana 26.

Leucobryaceae

Leucobryum javense (Brid.) Mitt. Pilock, Kanburi, c. 1000 m. growing on ground in shade. Feb. 24, 1967. C.Chermsirivathana 707.

Leucobryum sanctum Hampe Kaoyai, Nakorn-nayok, c. 600-700 m., on rotten log in evergreen forest. Mar. 17, 1965. Kasem 430.

Leucobryum scalare C.Mull. Kao Yai, Saraburi, on tree trunk in evergreen forest. Oct. 14, 1964. C.Chermsirivathana 9.

Ochrobryum kurzianum Hampe Doi Pui - Doi Sutep, c. 1600-1100 m., on tree trunk in evergreen forest. Mar. 25, 1965. C.Cherm-sirivathana 35.

Octoblepharum albidum Hedw. Brong Canal, Choempair, Kornkan, on tree in evergreen forest. Feb. 15, 1963. Adisai Chantanamuck 305.

Pottiaceae

Hyophila involuta (Hook.) Jaeg. Prew Waterfall, Chantaburi, on rock in waterfall. Dec. 2, 1964. Sakol 299.

Funariaceae

Funaria hygrometrica Hedw. Doi Nang, Chiengdao, Chiengmai, growing on rock in loamy soil. Nov. 13, 1963. Adisai Chantanamuck 658; Doi Pui - Doi Sutep, c. 1600-1100 m., on bare soil. Mar. 25, 1965. C.Cherm-sirivathana 33.

Bryaceae

Brachymenium nepalense Hook. Doi Pui - Doi Sutep, c. 1600-1100 m., on tree trunk in evergreen forest. Mar. 25, 1965. C.Cherm-sirivathana 26B.

Bryum coronatum Schimp. Kao Yai, Saraburi, on piece of old cement in evergreen forest. Oct. 14, 1964. C.Cherm-sirivathana 5.

Rhodobryum giganteum (Hook.) Schimp. Doi Luang, Chiengdao, Chiengmai, on rock, wet place in evergreen forest. Nov. 10, 1963. Adisai Chantanamuck 640.

Rhodobryum roseum (Hedw.) Limpr. Doi Pui - Doi Sutep, c. 1600-1100 m., on tree trunk. Mar. 25, 1965. C.Cherm-sirivathana 29.

Rhizogoniaceae

Rhizogonium sriniiforme (Hedw.) Bruch Kaoyai, Nakorn-nayok, c. 600-700 m., growing on stone by stream. Mar. 17, 1965. Kasem 429; same loc., on rotten log in evergreen forest. Kasem 431.

Bartramiaceae

Philonotis turneriana (Schwaegr.) Mitt. (?) Pilock, Kanburi, c. 1000 m., growing on wet ground. Feb. 24, 1967. C.Cherm-sirivathana 709.

Orthotrichaceae

Groutiella goniorhyncha (Doz. et Molk.) Wijk et Marg. Kaoyai, Nakorn-nayok, c. 600-700 m., growing on tree trunk in evergreen forest. Mar. 17, 1965. Kasem 433.

Macromitrium sulcatum (Hook.) Brid. Doi Pui - Doi Sutep, c. 1600-1100 m., on tree trunk in evergreen forest. Mar. 25, 1965. C.Chernsirivathana 26a.

Rhacopilaceae

Rhacopilum schmidii (C.Müll.) Mitt. Kao Yai, Saraburi, on bark of trees in evergreen forest. Oct. 14, 1964. C.Chernsirivathana 2.

Myuriaceae

Myurium rufescens (Reinw. et Hornsch.) Fleisch. Doi Pui - Doi Sutep, c. 1600-1100 m., on bark of fallen trees in evergreen forest. Mar. 25, 1965. C.Chernsirivathana 24.

Neckeriaceae

Calypothecium wightii (Mitt.) Fleisch. Kao Yai, Saraburi. Oct. 14, 1964. C.Chernsirivathana 8.

Himantocladium scrobiculatum (Nees) Bartr. Fang-Chiangmai, on tree branches in deciduous forest. Mar. 18, 1965. C.Chernsirivathana 14.

Homaliodendron flabellatum (Smith) Fleisch. Pilock, Kanburi, c. 1000 m., growing on wet rock. Feb. 24, 1967. C.Chernsirivathana 711.

Neckeropsis gracilentia (Bosch et Lac.) Fleisch. Kao Tan, Chaiya, Surat, on tree trunk in evergreen forest. July 12, 1966. Sakol 1257A.

Neckeropsis lepineana (Mont.) Fleisch. Kao Tan, Chaiya, Surat, on tree trunk in evergreen forest. July 12, 1966. Sakol 1257B.

Meteoriaceae

Meteoriopsis ancistrodes (Ren. et Card.) Broth. Doi Pui - Doi Sutep, c. 1600-1100 m., on bark of fallen trees in evergreen forest. Mar. 25, 1965. C.Chernsirivathana 24.

Leskeaceae

Thuidium cymbifolium (Doz. et Molk.) Bosch et Lac. Doi Sutep, on dry rocks in running water, Chiangmai. Mar. 23, 1965. C.Chernsirivathana 16; Pilock, Kanburi, c. 1000 m., on wet rock. Feb. 24, 1967. C.Chernsirivathana 712.

Thuidium meyenianum (Hampe) Bosch et Lac. Kao Yai, Saraburi, on tree in evergreen forest. Oct. 14, 1964. C.Chernsirivathana 3.

Brachytheciaceae

Rhynchostegium vagans (Harv.) Jaeg. Filock, Kanburi, c. 1000 m., on wet ground. Feb. 24, 1967. C.Chernsirinivathana 714.

Entodontaceae

Entodon angustifolius (Mitt.) Jaeg. et Sauerb. Doi Sutep, Chiangmai, on tree trunk near waterfall. Mar. 23, 1965. C.Chernsirinivathana 15.

Sematophyllaceae

Acanthocladium surculare (Mitt.) Broth. Doi Pui - Doi Sutep, c. 1600-1100 m., on tree trunk in evergreen forest. Mar. 25, 1965. C.Chernsirinivathana 30.

Clastobryum indicum (Doz. et Molk.) Doz. et Molk. See Morikawa and Ando, p. 34. 1964. Kao Yai, Saraburi, on tree trunk in evergreen forest. Oct. 14, 1964. C.Chernsirinivathana 10.

Sematophyllum tristiculum (Mitt.) Fleisch. Kaokheo, Nakorn-nayok, c. 1100 m., on twigs on misty hill-top. Mar. 21, 1965. Kasem 501.

Hypnaceae

Ectropothecium dealbatum (Hornsch. et Reinw.) Jaeg. Doi Pui - Doi Sutep, on tree trunk in evergreen forest. Mar. 25, 1965. C.Chernsirinivathana 25.

Isopterygium albescent (Schwaegr.) Jaeg. Kao Yai, Saraburi, on ground in evergreen forest. Oct. 14, 1964. C.Chernsirinivathana 4; Filock, Kanburi, c. 1000 m., growing on wet ground. Feb. 24, 1967. C.Chernsirinivathana 715.

Isopterygium micans (Sw.) Broth. Kao Yai, Saraburi, on ground in evergreen forest. Oct. 14, 1964. C.Chernsirinivathana 11.

Isopterygium textorii (Lac.) Mitt. Doi Pui - Doi Sutep, c. 1600-1100 m., on rock in evergreen forest. Mar. 25, 1965. C.Chernsirinivathana 34.

Taxiphyllum taxirameum (Mitt.) Fleisch. Hui Yang, Prachuap, on wet ground near waterfall. Oct. 24, 1964. C.Chernsirinivathana 13.

Vesicularia montagnei (Bel.) Broth. Doi Sutep, Chiangmai, on surface of rock near waterfall. Mar. 23, 1965. C.Chernsirinivathana 20.

Hylocomiaceae

Leptohymenium tenue (Hook.) Schwaegr. Doi Luang Chiengdoa, Chiengdoa, Chiengmai, growing on wet places, on rocks, in evergreen forest. Nov. 10, 1963. Adisai Chantanamuck 641.

Macrothamnium macrocarpum (Reinw. et Hornsch.) Fleisch. Doi Pui - Doi Sutep, on bark in evergreen forest. Mar. 25, 1965. C. Chermisrivathana 31.

Polytrichaceae

Pogonatum junghuhnianum (Doz. et Molk.) Bosch et Lac. Doi Sutep, Chiengmai, on bare soil. Mar. 25, 1965. C. Chermisrivathana 22; Pilock, Kanburi, c. 1000 m., on wet soil. Feb. 24, 1967. C. Chermisrivathana 706; same loc., on wet ground, with Garckea comosa and Dicranella brasiliensis. Feb. 24, 1967. C. Chermisrivathana 710.

In our first paper (Phytologia, 15(1): 61-70. 1967), the following typographical corrections should be made:

Caudalejeunia fruticosa (L. et G.) Steph.

Bartramidula bartramioides (Griff.) Wijk et Marg.

Taxithelium instratum (Brid.) Broth.

BOOK REVIEWS

Alma L. Moldenke

"VEGETATION MAPPING" by A. W. Kuchler, vi & 472 pp., illus.
Ronald Press, New York City, N. Y. 10010. 1967. \$15.00

Americans interested in any and all of the phases of plant geography have had to go to the German, Austrian, Russian and French sources for the major literature and maps until the appearance of this book which is not only 'first' in our language here but also 'first' in quality and scope of coverage. It starts with an historical survey of the last five centuries of vegetation cartography, then, considering vegetation as a mosaic of identifiable plant communities in the landscape, discusses classifications of it and standardization, and follows with technical aspects and mapping methods along with their many applications in geology, pedology, agriculture, forestry, land management, climate recording, botanical researches, military, fiscal, engineering, commercial and other activities.

He equates our term 'ecosystem' for a plant community and its environment with the Soviet term 'biogeocenose'.

The author has himself produced some excellent vegetation maps, edits the "International Bibliography of Vegetation Maps", and teaches at present the only course in this subject in this country at the University of Kansas. Kuchler's own method of vegetation mapping is a combination of Braun-Blanquet's with Gaussen's color patterns.

The list of references and the thorough index are valuable. The type and text are easily readable. "Whereas" is misspelled on p. 107. Occasionally some material is repeated unnecessarily. This book might well prove to be the impetus for real progress in this field of endeavor in our country.

"INTRODUCTION TO GENETICS AND CYTOGENETICS" by Herbert Parkes
Riley, xii & 596 pp., illus., Hafner Publishing Co., New York City, N. Y. 10003 & London. 1967. \$12.50

This facsimile edition of this classical out-of-print work on classical genetics originally brought out by John Wiley & Sons in 1948 makes available to the genetics student and general biology student the background subject matter upon which today's modern hereditary studies are based. Fortunately for this purpose one of the finest texts was chosen.

"TROPICAL PLANT TYPES" by B. G. M. Jamieson & J. F. Reynolds, viii & 347 pp., illus., Pergamon Press, International Library Series, New York City, N. Y. 10022, London, Paris, Sydney. 1967.
\$7.50 flexi-cover, \$8.50 hard-cover.

This is just a mediocre botany text with not particularly inspired writing but with quite well drawn illustrations mostly of tropical plants or their parts. There are a few errors such as, on p. 159, the use of the name Avicennia officinalis for the Australian grey mangrove instead of A. marina var. resinifera — the former species being totally unknown in the Australian region. His use of the name Avicennia nitida for the West African white mangrove is certainly also incorrect. The plant involved should be called A. germinans or A. africana depending on whether or not one regards it as specifically different from its American counterpart.

There is so much more that is special about tropical plant life that is not even mentioned in this book. Corner's book is so much superior!

"KAUAI AND THE PARK COUNTRY OF HAWAII" by Robert Wenkam, edited by David Brower for the Exhibit Format Series, 159 pp., illus., Sierra Club, San Francisco, California 94104. 1966. \$25.00

Exquisitely reproduced photographs — most of them in wonderful color — and excellently chosen text of the author's own fine and convincing writing, of native legendary poetry, of Mark Twain and of James Michener among others smitten by either the unique beauty of this and the other Hawaiian islands or by the very real need to conserve our natural resources or both, make an appeal through this beauty and logic for the preservation of much of western Kauai as a national park. Its forests and other native plants have not yet been seriously chopped down or overrun by introductions. The sea cliffs have not yet been marred by construction. The native birds and other animals still have the place as home. But what havoc has been wrought on other parts and on the other islands by the greed and/or ignorance of cattlemen, cane growers, military, utility and construction people, and even some botanists whose unfortunate introductions have released what Hawaii's Otto Degener has called a "Pandora's Box of biological evils!"

The inconspicuous addition of scientific names would have increased the value of the book for many viewers.

Long may the Sierra Club and other groups succeed in directing the attention of the general public to the vital need for conserving the natural resources of our world!

"WORKBOOK IN GENERAL BOTANY" by Clarence E. Taft, Bernard S. Meyer, Glenn W. Blaydes and the late H. C. Sampson, xiii & 216 pp., illus., Harper & Row, Publishers, New York City, N. Y. 10016, Evanston, & London. 1966. \$4.95

This better than average workbook is designed for the beginning course in botany for both students intending to specialize and those who do not. It covers the topic well, it is well illustrated, it asks some intelligent questions — a fortunate break

from the older catechetical approach. A "prof" might really do some ingenious things with it. On p. 27 part, not all, of a privet leaf is shown in cross section and should be so labeled. On p. xi the older generic name is used for the orange-orange instead of the later but conserved Maclura.

Organizing the pages within only a thin paper wrapper is impractical.

"ADVANCES IN ECOLOGICAL RESEARCH", Volume IV, edited by J. B. Cragg, xi & 311 pp., illus., Academic Press, London W.1 & New York City, N. Y. 10003. 1967. 80 sh or \$13.50

Another fine volume in this series presents more research findings of outstanding ecologists about the workings of various ecological systems and leading to theoretical concepts to explain the modes of functioning of these ecosystems.

In "Pattern and Process in Competition" Richard S. Miller surveys the nature of competition throughout much of the animal world and concludes with the thought that there is a possible parallel between mechanisms of population control, interspecies competition and species isolation, all of which influence the species diversity or natural communities.

In "A Synopsis of the Pesticide Problem" W. W. Moore shows that both pest control and pesticide control are ecological factors with broad-range effects on much more of the biota than just the target organisms, even more on aquatic than on terrestrial forms. Natural selection of resistant strains, organo-chlorine contaminated food chains, sublethal effects upon reproduction and behavior, density-independent toxic effects varying with age, sex, species and individuals - are all carefully discussed. Future trends seem to be towards complete control of very simple systems and integrated control of complex systems.

In "The General Biology and Thermal Balance of Penguins" B. Stonehouse summarizes the widely scattered literature for the 18 species and 6 subspecies of these southern hemisphere flightless marine birds, many of whom spend half of their lives in water and discusses the probable significance of heat regulation in relation to morphology (as increased plumage length, decreased flipper surface) and behavior (as huddling).

In "Ecological Studies at Lough Ine" J. A. Kitching and F. J. Ebling give an initial comprehensive review of the studies carried on by them and their many students at this marine research station on the coast of Ireland. They have been studying how the distribution of the marine organisms of this limited area is determined, how they react with each other and with their inanimate environment, and how their numbers are controlled.

Thorough bibliographies are given after each paper; useful author and subject matter indexes are given at the end.

"INTRODUCTION TO MICROBIOLOGY" by Stanley E. Wedberg, xvii & 426 pp., illus., Reinhold Publishing Corp., New York City, N. Y. 10022 & Chapman and Hall Ltd., London. 1966. \$8.50

Just as the author, a well experienced teacher, states in his preface, "This book presents these basic essential fundamentals in simple, concise, clear terms, and the text should serve as a valuable reference not only for recent graduates but also for those students taking their first or even second course in this biological science". The modern detailed chemical advances in this field can only be appreciated properly upon such a subject matter background.

"SOURCEBOOK OF LABORATORY EXERCISES IN PLANT PATHOLOGY" edited by Arthur Kelman, Chairman, Sourcebook Committee of the American Phytopathological Society, xxvii & 388 pp., illus., W. H. Freeman & Co., San Francisco, California 94104 & London. 1967. \$8.50

Post-Sputnik several of the outstanding scientific organizations in our country with financing from the National Science Foundation and other sources made worthwhile contributions toward improving course content, experimentation, texts and teachers' subject matter background for the high school and college sciences. This book is one of them, revised and improved since the temporary effort of 1962. It will probably become the backbone for almost all of our plant pathology courses for the next decade or so. It will even influence such training in other countries and on other levels, as high school biology enrichment, club activity or individual student's projects because the directions are clearcut and because there are such varied and useful indexes.

"INTRODUCTION TO PLANT BREEDING" by Fred N. Briggs & P. F. Knowles, xviii & 426 pp., illus., Reinhold Publishing Corp., New York City, N. Y. 10022, Amsterdam & London. 1967. \$12.50

This addition to the Reinhold Books In Agriculture Series by authors well experienced in the field and in teaching is planned as a text for an introductory course for advanced undergraduate students, covers all phases of the field with clarity of explanation and illustration, and succeeds in effectively relating plant breeding to underlying genetic principles.

The explanations of Lysenkoism and Michurinism are valuable for the students to have.

"THE LIFE OF THE OCEAN" by N. J. Berrill, 232 pp., illus., McGraw-Hill Book Co., New York City, N. Y. 10036, & Toronto, Canada. 1967. \$4.95

This new addition to the attractive, interesting and scientifically well done series of "Our Living World of Nature" is jointly published by the World Book Encyclopedia in cooperation with the U. S. Department of the Interior. There are 117 beautiful and impressive true-color photographs and also many attractive and helpful diagrams, maps and drawings making the book a pictorial

treat. A glossary, appendices and index make access and interpretation easy. The addition of scientific names would have been really helpful to many readers.

The text is natural history and ecology oriented. Except for the sketch of *Laminaria*, the mention of algae coloring the mantle edges of the giant clam, and the role of microscopic plants at the bottom of the food chain, the book is all zoology. A general reader might end up with an incorrect sense of proportion which certainly the expert author does not have.

"THE OUTER ISLANDS - A Natural History Guide to Cape Cod, Martha's Vineyard, Nantucket, Block Island and Long Island" by Dorothy Sterling, 192 pp., illus., Natural History Press, Garden City, New York. 1967. \$4.50

This charmingly written and attractively illustrated (both in color and in black and white, by Winifred Lubell) collection of wild life notes and pictures provides a very pleasant introduction to the natives and the ever increasing number of seasonal visitors who cannot help but observe the fascinating creatures in the ecological communities along these shores. Because this work is a popular one, it is not intended to be a complete scientific survey. It does hit the high spots admirably. Very few errors show up. On p. 179 the pipewort is listed as *Eriocaulon articulatum*, but the plant referred to should be called either *E. septangulare* or *E. pellucidum* depending on whether or not one regards the American race specifically distinct from the European.

"MOMENT IN THE SUN - A Report on the Deteriorating Quality of the American Environment" by Robert Rienow and Leona Train Rienow, xii & 287 pp., Dial Press, New York City, N. Y. 10017. 1967. \$6.00

The background of these writers is one of social science teaching and writing, of much service for the Nature Conservancy and of effective restoration of over-exploited farm land into a masterpiece of ecological balance. They and all the other aware leaders in the field of conservation have been warning us that "Our moment in the sun is passing" because of the direct results of and the by-products of our "progress" are poisoned air to breathe, sewer and chemically polluted water to drink, eroded and impoverished terrain with concomitant water supply loss and flooding destruction, contaminated crops, exhaustive and wasteful consumption of nature's products, homeless and dying wildlife and the extinction of some, and humanity burgeoning at a terrifying rate and its concomitant loss of personal liberty.

All in this book is stated effectively, factually and with thorough documentation. There is no exaggeration just to create compelling attention. It is all true and the results - almost too horrible to contemplate - are inevitable unless immediate action is taken to reverse the present deleterious trends. Thank God this book has been written; May many, many read it thoughtfully!

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A PRELIMINARY REPORT ON WOYTKOWSKI'S LAST PERUVIAN COLLECTIONS

By John D. Dwyer
Dept. of Biology, St. Louis University & Missouri
Botanical Garden, St. Louis, Missouri

From May 1958 until September 1962 the late Felix Woytkowski, then residing in Lima, Peru, collected in eight central and northern provinces of Peru 3338 numbers of flowering plants and ferns with one to eight samples per number. These were sent to the Missouri Botanical Garden where the vast majority have been identified. Many of the earlier numbers and a goodly amount of later numbers have been sent to several large American herbaria. Woytkowski was especially interested in collecting any woody plants reported by the natives as having medicinal properties; many of his collections serve as vouchers for large samples of the dried vegetative portions of plants suspected of being medicinally important. Ciba Pharmaceutical Company of Summit, New Jersey, sponsored Woytkowski's recent field work in Peru up to 1964, as well as supported in part the herbarium work at the Missouri Botanical Garden. I wish to acknowledge this support.

Woytkowski, as his labels attest, made great efforts in the field to gain information concerning medicinal uses of the plants as well as the native names. For recent reviews of common names of Peruvian plants the reader may consult Biota, IV, pp. 77-91, 102-144, 164-192, 205-236 (1962), 259-276, 281-316, 353-368 (1963), V, pp. 6-41 (1964), cont'd. The fact that Woytkowski collected much material of the Apocynaceae, Bignoniaceae, Compositae, Euphorbiaceae, Leguminosae, Malpighiaceae, Melastomaceae, Piperaceae, Rubiaceae, Sapindaceae, and Solanaceae reflects this interest. A modest number of representatives of the following families were collected: Guttiferae, Loranthaceae, Menispermaceae, Orchidaceae, and Verbenaceae.

While the late Dr. Robert E. Woodson Jr., Curator of the Herbarium at the Missouri Botanical Garden, supervised the identification of the Woytkowski collections (nos. 5000 to 8186) until his death in November of 1963, most of the routine herbarium identifications were made by Dr. James A. Duke, now of Battelle Memorial Institute, Columbus Ohio, who served as Assistant Curator at the Missouri Botanical Garden during most of the period from October 1958 to September 1962. Noteworthy is the fact that Duke and Bunting described in 1961 a new genus of the Loganiaceae, Sanango (Ann. Mo. Bot. Gard. 48: 270.)

The following specialists were kind enough to identify a limited number of specimens in the years 1958-1962: Caroline K. Allen, George Bunting, Jose Cuatrecasas, R.S. Cowan, Calaway H. Dodson, Robert L. Dressler, Richard Holm, Gordon Hunter, Paul C. Hutchinson, Hugh Iltis, John Ingraham, E.C. Leonard, Alicia Lourteig, Bassett Maguire, Herbert Mason, Mildred Mathias, Rogers McVaugh, Harold Moldenke, C.V. Morton, Loren I. Nevling, Steven Oakland, Howard Pfeifer, Peter H. Raven,

André Robyns, N.Y. Sandwith, L.B. Smith, William L. Stern, Dieter Wasshausen, R. Woodson, J.J. Wurdack, and T.G. Yuncker.

While I played a minor role in identifying the Woytkowski collections prior to September 1963, I determined many of the collections from No. 7000 to 8338. In addition, I rechecked a number of puzzling collections in the No. 5000 to No. 7000 sequence as well as supplied a modicum of binomials for unidentified numbers. Hopefully in the near future a complete list of Woytkowski's more than 3300 numbers will be published.

The Woytkowski collection under discussion supplies taxonomists with a representative, though obviously limited cross-section of the phanerogams, especially those of the Dicotyledoneae, as well as of the ferns, in choice collecting areas north of Lima, especially at elevations between 800 and 2500 meters. Woytkowski's collections are ornaments in any herbarium as he dried his plants with unusual care.

The following is a list of the localities in Peru, including the respective Departments, the numerical ranges of collection lots, the specific localities, and the months in which collections were made. The Departments of Peru in which Woytkowski collected are abbreviated as follows:

- (A) Department of Amazonas;
- (C) Department of Cajamarca;
- (H) Department of Huanuco
- (J) Department of Junin
- (LA) Department of Lambayeque
- (L) Department of Loreto
- (P) Department of Pasco
- (SM) Department of San Martin

1958

Tingo Maria (H) 650 m.	May - June	5000 - 5009
Santa Isabel to Cucharas including Río Pacay (H) 600 m.	June	5010 - 5020
Tingo Maria (H) 650 m.	June	5021
Chinchao Carpish (H) 2400 m.	June	5024
Monzón (H)	June - July	5029 - 5031
Saposoia (SM) 400 m.	July	5034 - 5104
Río San Alejandro (L) 300 m.	July	5105 - 5124
Iquitos (Nanay River) (L)	December	5125 - 5174

1959

Panao (H)	March	5175 - 5189
Muña (H)	March	5190 - 5268
Chaglia (H)	March	5269 - 5295
Tingo Maria (H) 670 m.	April	5296 - 5311
Monzón (H)	April	5312 - 5334
Aguaytia (L) 250 m.	May - June	5335 - 5376
Tingo Maria (H) 670 m.	August	5377 - 5399
Saposoia (SM)	September	5400 - 5417
Gramalote (SM) - forested ravine		
N. of Saposoia	October	5418 - 5502
Huahuiva (SM) - N.W. of Saposoia	October	5503 - 5517

<u>1960</u>	
Huatsiroke (L) 1800- 2500 m.; rain forest of Ia Merced	February - March 5536 - 5581
Jaen (C) 500 m.; very dry Andean woods between Jaen and Olmos	March 5582 - 5612
Aramango (A) - S. of Nazaret, shores of Río Marañon	April 5613 - 5646
Mirana (A)	April 5647 - 5655
Pucara between Jaen & Olmos (C) 900 m.	April 5656 - 5691
Montana de Santa Rosa (C) 1200 m.; rain forest	April - May 5692 - 5744
Pucallpa (L) 2400 m.; low deciduous forests	June 5745 - 5788
Río Negro to Satipo (J) 750 - 1000 m.	August 5789 - 5878
Satipo (J) 750- 1000 m.; forested hills	September 5879 - 5926
Sanibeni (J) 750 - 1000 m.; forested hills	October 5927 - 5963
Mazamari (J) 750 - 1000 m., forested hills	October 5964 - 6028
Rioja (SM) 800 m.; secondary forests	December 6029 - 6171

1961

Río Negro to Rioja, Río Seco - Trapiche (SM)	January 6172 - 6259
Pucallpa (L) 2400 m.	April 6260
Yarinacocha (L)	April 6261 - 6281
Ucayali River & Paucocha (L)	April 6282 - 6307
Pacacocha (L)	May 6308 - 6325
Yaupi (J) 1580 m.	June 6326 - 6510
Manto (J) 1100 m.	June 6511 - 6552
Yaupi (J) 1580 m.	July 6553 - 6562
Yunguy (J) 1600 m.	July 6563 - 6616
Yucapata (J) 1400 m.	July 6617 - 6675
Paucartambo (J) 2800 m.	July 6676 - 6748
Olmos between Chiclayo & Pucará (IA & C)	September 6749 - 6750
Purculla (IA & C) 2400 m.; low deciduous forest	September 6751 - 6794
Mandanguia (C) 800 m; low deciduous forest	October 6795 - 6928
Colasai (C) 2500 - 2800 m.; humid subtropical forests	October 6929 - 6957
Mandanguia (C)	October 6958 - 6971
Colasai (C)	November 6972 - 7036
Mandanguia	November 7037 - 7070

<u>1962</u>		
Juanjui (SM) 400 - 600 m.;		
tropical forests Rio		
Huallaga	March	7071 - 7122
Huinguillo (SM) 400 - 600 m.		
S. of Rio Huallaga	March	7123 - 7189
Santa Luisa (SM) 400 - 600 m.		
forested hills Huallaga		
Valley	March	7190
Costarica (SM) 600 m. - E. of		
Santa Luisa	March	7191
Huinguillo (SM)	March	7192 - 7194
Juanjui (SM)	April	7195 - 7225
Saposa (SM)	April	7226 - 7299
Gramalote (SM); forested ravine		
N. of Saposoa	May	7300 - 7317
Huahuiva (SM); N.W. of Saposoa	May	7318 - 7322
Villarica (P) 1500 m; forested		
hills	June	7323 - 7355
Hacienda Genova (J) 1600 m.;		
forested mountains	July	7356 - 7401
San Ramon (J) 900 m.; valley		
of Chanchamayo	July	7402 - 7415
Agua Dulce & Utcuyacu (J)		
1600 - 1800 m.; forested		
mountains	July	7416 - 7484
San Ramón (J) 900 m.	August	7485 - 7489
Pendencia (H) 700-900 m.;		
forested Rio Huallaga, 30 km.		
N.E. Tingo Maria	Sept.-Nov.	7490 - 7536
Previsto (L) 420-500 m. confluen-		
ce of Previsto & Yurac Rivers;		
rain fall 4,950 mm.	Sept.-Nov.	7537 - 7639
Palo de Acero (H) 900 - 1000 m.;		
region of Rio Monzón forests		
N.W. of Tingo Maria	Sept.-Nov.	7640 - 7669
Leimbebamba (A) 2000 - 2500 m.;		
near rainy alpine tundra	Sept.- Nov.	7670 - 7846
Cachicoto (H) 800 m.; S of		
Monzon	March - April	7847 - 7910
Tumanga (H) 2400 m.; rain		
forests of Cordillera		
Carpish, N. of Acomayo	March - April	7911 - 8015
Rodriguez de Mendoza (A) 1400-		
2500 m.; low forests E.		
Andean slopes	July - August	8018 - 8186
Rodriguez de Mendoza (A) 1500 m.	August-Sept.	8187 - 8338

In the summer of 1964 Woytkowski sent a few additional collections to the Missouri Botanical Garden. These were collected in Juanjui, Department of San Martin. I wish to thank Dr. André Robyns for reading the ms. and Sister M. Victoria Hayden for the critical analysis of seed structure in some collections of Rubiaceae.

NOTES ON NEW AND NOTEWORTHY PLANTS. XLIX

Harold N. Moldenke

ALOYSIA GRATISSIMA var. *OBLANCEOLATA* Moldenke, var. nov.

Haec varietas a forma typica speciei foliis plerumque oblanceolatis recedit.

This variety differs from the typical form of the species in having its leaf-blades mostly oblanceolate and usually only 1--1.5 cm. long and 3--7 mm. wide, decidedly rounded at the apex.

The type of the variety was collected by Alma Lance Moldenke and Harold Norman Moldenke (no. 19684) in hedgerows at Gloria, southeast of Porto Alegre, Rio Grande do Sul, Brazil, on October 2, 1948, and is deposited in the Britton Herbarium at the New York Botanical Garden.

ERIOCAULON DECANGULARE var. *MINOR* Moldenke, var. nov.

Haec varietas a forma typica speciei foliis parvioribus tenuioribusque et capitulis 5--10 mm. latis compressis recedit.

This variety differs from the typical form of the species in having its leaves shorter and more tenuous in texture and its flower-heads only 5--10 mm. wide and sufficiently soft to easily be compressed when in anthesis or fruit.

The type of the variety was collected by Fred Alexander Barkley (no. 13543) in a bog near New Baden, Robertson County, Texas, on August 8, 1943, and is deposited in the Britton Herbarium at the New York Botanical Garden. It represents what appears to be a variety of pipewort endemic to Texas and Louisiana, originally distributed as the European *E. septangulare* With., then regarded as representing *E. texense* Körn., but recently shown by R. Kral to have the essential floral characters of *E. decangulare* L.

LANTANA VELUTINA var. *LONGIFOLIA* Moldenke, var. nov.

Haec varietas a forma typica speciei recedit laminis foliorum membranaceis anguste ellipticis 7--10 cm. longis 1.7--2.5 cm. latis margine crenatis.

This variety differs from the typical form of the species in having its leaf-blades rather thinly membranaceous, narrowly elliptic, 7--10 cm. long when mature and 1.7--2.5 cm. wide, the margins coarsely crenate.

The type of the variety was collected by Alison Bishop Moldenke and Andrew Ralph Moldenke (no. 2201) as an abundant roadside weed on Route 140 seventy km. west of Ciudad Veracruz, Veracruz, Mexico, on August 1, 1967, and is deposited in my personal herbarium at Plainfield, New Jersey. The collectors note that the corollas were white, opening with a yellow center which fades to pure white later.

PAEPALANTHUS CONVEXUS var. MAJOR Moldenke, var. nov.

Haec varietas a forma typica speciei foliis 5--7 cm. longis pedunculis 22--47 cm. longis et capitulis 13--15 mm. latis recedit.

This variety differs from the typical form of the species in having its leaves 5--7 cm. long, the peduncles 22--47 cm. long, and the heads 13--15 mm. wide.

The type of the variety was collected by Nilo T. Silva and Umbelino Brazão (no. 60926) in a low humid catinga forest at 1300 to 1700 meters altitude, Serra Pirapucú, Rio Negro, Rio Cauaburi, Rio Maturacá, Amazonas, Brazil, on January 27, 1966, and is deposited in the Britton Herbarium at the New York Botanical Garden.

PAEPALANTHUS STEGOLEPOIDES var. ACUTALIS Moldenke, var. nov.

Haec varietas a forma typica speciei foliis 4--7 cm. longis et bracteolis involucri ad apicem argute acutis recedit.

This variety differs from the typical form of the species in having its leaves 4--7 cm. long and the involucral bractlets sharply acute at the apex.

The type of the variety was collected by Bassett Maguire, João Murça Pires, and Celia K. Maguire (no. 60509) on open slopes to base of cliffs, altitude 8500 to 9000 feet, on the Rio Negro, Rio Cauaburi, Amazonas, Brazil, on December 2, 1965, and is deposited in the Britton Herbarium at the New York Botanical Garden.

SYNGONANTHUS KUHLMANNII f. VIVIPARUS Moldenke, f. nov.

Haec forma a forma typica speciei capitulis plerumque viviparis recedit.

This form differs from the typical form of the species in having its heads mostly partly or completely viviparous.

The type of the form was collected by G. T. Prance, B. S. Pena, E. Forero, J. F. Ramos, and O. P. Monteiro (no. 4790a) in a forest on terra firma, north of the road on the right bank of the Rio Urubu, on the Manaus-Itacoatiara Highway, Amazonas, Brazil, on April 5, 1967, and is deposited in my personal herbarium at Plainfield, New Jersey.

- - - - -

ADDITIONAL NOTES ON THE GENUS ACANTHOLIPPIA. I

Harold N. Moldenke

ACANTHOLIPPIA Griseb.

Additional & emended bibliography: F. Phil., Cat. Pl. Vasc. Chil. 218. 1881; Hieron., Bol. Acad. Nac. Córdoba 4: 407--408. 1881; Lorentz & Niederlein, Bot. Exped. Rio Negro 266--267. 1881; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 1: 18 (1893) and 2: 95 & 96. 1894; Briq. in Engl. & Prantl, Nat. Pflanzenfam. 4 (3a): 151 & 152. 1894; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 2: 1178. 1895; Kuntze, Rev. Gen. Pl. 3 (2): 252. 1898;

Durand & Jacks., Ind. Kew. Suppl. 1: 250. 1903; Velenovský, Vergl. Morphol. Pfl. 2: pl. 3. 1907; Tavares, Broter. Zool. 13: 97--98, pl. 3, fig. a. 1915; Hicken, Physis 2: 114. 1916; Pereyra, Bol. Univ. Nac. Tucumán Mus. Hist. Nat. 8: pl. 1 & 2. 1926; Stapf, Ind. Lond. 4: 125. 1930; Huard, Zoocéd. Pl. Amer. Sud 349--350, fig. 813 (a). 1933; Worsdell, Ind. Lond. Suppl. 2: 58. 1941; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 2, 1: 18 (1946) and 2: 95, 96, & 1178. 1946; Acevedo de Vargas, Bol. Mus. Nac. Hist. Nat. [Santiago, Chile] 25: 36--38, fig. 1A. 1951; E. J. Salisb., Ind. Kew. Suppl. 11: 2. 1953; Acevedo de Vargas, Biol. Abstr. 28: 904. 1954; Darlington & Wylie, Chromosome Atl., pr. 1, 324 & 501. 1955; Hocking, Dict. Terms Pharmacog. 128. 1955; Angely, Cat. Estat. Gen. Bot. Fan. 17: 2. 1956; Anon., U. S. Dept. Agr. Bot. Subj. Index 15: 14358. 1958; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 3, 1: 18 (1960) and 2: 95, 96, & 1178. 1960; Muñoz Pizarro, Espec. Plant. Descr. Philippi 110. 1960; Darlington & Wylie, Chromosome Atl., pr. 2, 324 & 501. 1961; Moldenke, Biol. Abstr. 36: 2311. 1961; Moldenke, Phytologia 7: 326--338. 1961; Hocking, Excerpt. Bot. A.4: 224. 1962; Moldenke, Résumé Suppl. 12: 10. 1965; Moldenke, Phytologia 12: 6, 20, 22, 23, 27, 30, 36--38, 287, & 288. 1965; Airy-Shaw in Willis, Dict. Flow. Pl., ed. 7, 6. 1966.

Airy-Shaw (1966) correctly states that there are 5 known species in this genus. There is considerable confusion about the exact dates of publication of some of the important works on this group by F. Philippi and R. A. Philippi. For instance, the 1865 reference given in the bibliography of this genus by me is sometimes cited as "27: 35" or "27 (2): 350", the 1870 reference is often cited as volume "35", and the 1896 reference is cited by Muñoz Pizarro (1960) as "1895". The Cabrera (1947) reference is sometimes given as page "20" and dated "1948", apparently in error. Briquet (1894) proposed the Section Acantholippia (Griseb.) Briq. for this group of species within the genus Lippia Houst.

ACANTHOLIPPIA DESERTICOLA (R. A. Phil.) Moldenke

Additional & emended synonymy: Lippia trifida R. A. Phil., Fl. Atac. 40. 1860 [not L. trifida Clos, 1865, nor C. Gay, 1849, nor Remy, 1881]. Lippia deserticola F. Phil., Cat. Pl. Vasc. Chil. 218. 1881. Lippia microphylla F. Phil., Anal. Univ. Chile 27: 350. 1865 [not L. microphylla Benth., 1894, nor Cham., 1832]. Lippia salsoloides Benth. & Hook. f. ex Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 2: 95. 1894. Lippia salsoloides (Griseb.) Briq. in Engl. & Prantl, Nat. Pflanzenfam. 4 (3a): 15a. 1894. Lippia salsoloides Briq. apud Durand & Jacks., Ind. Kew. Suppl. 1, pr. 1, 250, in syn. 1903. Lippia deserticola R. A. Phil. apud Moldenke, Lilloa 5: 370, in syn. sphalm. 1940. Lippia macrophylla R. A. Phil. apud Muñoz Pizarro, Espec. Pl. Descr. Philippi 110, sphalm. 1960 [not L. macrophylla Cham., 1832, nor Cham. & Schlecht., 1965]. Acantholippia deserticola (F. Phil.) Moldenke, Résumé Suppl. 4: 11 & 12. 1962.

Additional & emended bibliography: R. A. Phil., Fl. Atac. 40. 1860; F. Phil., Anal. Univ. Chile 27: 350. 1865; Benth. in Benth. & Hook. f., Gen. Pl. 2: 1143. 1876; F. Phil., Cat. Pl. Vasc. Chil. 218. 1881; Hieron., Bol. Acad. Nac. Cienc. Córdoba 4: 407. 1881; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 1: 18 (1893) and 2: 95 & 96. 1894; Briq. in Engl. & Prantl, Nat. Pflanzenfam. 4 (3a): 151 & 152. 1894; Durand & Jacks., Ind. Kew. Suppl. 1, pr. 1, 250 (1903) and pr. 2, 250. 1941; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 2, 1: 18 (1946) and 2: 95 & 96. 1946; Acevedo de Vargas, Bol. Mus. Nac. Hist. Nat. [Santiago, Chile] 25: 36--37. 1951; E. J. Salisb., Ind. Kew. Suppl. 11: 2. 1953; Durand & Jacks., Ind. Kew. Suppl. 1, pr. 3, 250. 1959; Muñoz Pizarro, Espec. Pl. Descr. Philippi 110. 1960; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 3, 1: 18 (1960) and 2: 95 & 96. 1960; Moldenke, Phytologia 7: 329--330. 1961; Moldenke, Résumé Suppl. 4: 11 & 12 (1962) and 12: 10. 1965; Moldenke, Phytologia 12: 287 & 288. 1965.

It is worth noting here that the "Index Kewensis" reference given in the synonymy and bibliography above as "1894" is often cited as "1895". Actually, according to a memorandum by the late Dr. J. H. Barnhart, volume 1 of the first printing of this work (from A to J) was issued in 1893, of volume 2 pages 1 to 640 (K to Ps) were issued in 1894 and only pages 641 to 1299 (Ps to Z) were issued in 1895. Similarly, of the first printing of Supplement 1, pages 1 to 120 were issued in 1901, pages 121 to 224 were issued in 1902, pages 225 to 328 were issued in 1903, and pages 329 to 519 were not issued until 1906. It is unfortunate that these actual publication dates are not clearly stated in the recent reprint editions of these works.

Recent collectors describe this plant as a very fragrant shrub, 0.6--1 m. tall. The flowers are described as "white" on Venturi 6933 & 10129. The species has been found growing at altitudes of 2200 to 4500 meters, fruiting in March.

Muñoz (1960) claims that the binomial, Lippia macrophylla, was published by R. A. Philippi in Anal. Univ. Chile 90: 622 (1895) [=1896], but the name that appears on that page of Philippi's work is clearly spelled "Lippia microphylla". Actually, this binomial was proposed by F. Philippi as a substitute name for Lippia trifida R. A. Phil. (1860), which is a homonym of L. trifida C. Gay (1849). Later he proposed Lippia deserticola for the same plant when he discovered that Lippia microphylla F. Phil. is a homonym of L. microphylla Cham. (1832). His discussion of L. microphylla (1865) follows: "20.--Lippia microphylla Ph. L. fruticosa, intricato-tomentosa, ramis brevibus, saepe spinescentibus; foliis minimis, sessilibus, trifidis, crassiusculis, canescentibus; laciniis ovatis, subtus sulcato-canaliculatis, media magis producta; spicis breviusculis; calycis hispidi elongati dentibus spinescentibus. L. trifida Ph. Viage al des. de Atacama p. 214 non L. trifida Clos. Frequent in parte boreali deserti Atacama. La descripción que el señor Clos da de su L. trifida se aplica bastante bien a la L. microphylla, pero habiendo ahora recibido del señor Geisse ejemplares de la trifida pude conocer las difer-

encias. Ambas especies son muy olorosas, pulverulento-tomentosas, pero en la L. trifida los pelitos son amarillentos, en la microphylla son blanquiceros; ambas especies tienen hojas sesiles trifidas, pero en la L. microphylla son mucho menores, alcanzando apenas a 2 milímetros, mientras en la L. trifida tiene 5 milímetros de largo, y son más gruesas, con un surco profundo en la cara inferior; en ambas especies los cálizos son hispido-lanudos, pero en la L. microphylla los pelos son más largos, y los dientes del cáliz casi espinudos. En fin, el aspecto del arbusto debe ser bastante distinto porque la L. trifida según parece tiene las ramas mucho más largas y delgadas." Muñoz notes "Abundante en la parte noroeste del desierto de Atacama", and this is quite true of Acantholippia deserticola.

An actual isotype of Verbena deserticola R. A. Phil., the taxon on which Acantholippia deserticola is actually based, represented by R. A. Philippi s.n., was photographed by Macbride in the herbarium of the Botanisches Museum at Berlin as his type photograph number 17501, but is now unfortunately destroyed. The actual type specimen of Acantholippia salsoloides Griseb., on which the genus is based, represented by Lorentz 457, was also photographed by Macbride in the same herbarium as his type photograph number 17540 and is now also destroyed.

It is, perhaps, worth noting here that the Lippia macrophylla of Chamisso, referred to in the synonymy above, is a synonym of Lantana macrophylla (Cham.) Schau.; the Lippia microphylla of Chamisso is a valid species of Lippia, while that accredited to Benthham is L. schomburgkiana Schau. and that accredited to Chamisso & Schlechtendal is L. microphylla Cham.

Material of A. deserticola has been misidentified and distributed in herbaria under the names Lampaya medicinalis Phil. and Lippia hastulata (Griseb.) Hieron.

Additional citations: BOLIVIA: Potosí: Asplund 12352 (W—1159354). CHILE: Antofagasta: Barros 6525 (W—2168216); Martcorena, Matthei, & Quezada 431 (Ac); Ricardi 2991 (Ac), 3006 (Z); Ricardi & Martcorena 4649/1037 (Ac), 4658/1046 (Ac), 4839/1227 (Ac); Werdermann 1024 (W—1474176). Atacama: R. A. Philippi s.n. [Macbride photos 17501] (N—photo of isotype, W—photo of isotype). Tarapacá: Ricardi 3363 (Ac); Ricardi & Martcorena 4725/1133 (Ac); Ricardi, Martcorena, & Matthei 77 (Ac). ARGENTINA: Catamarca: Jörgensen 1736 (Ca—3467, W—874767); Lorentz 457 [Macbride photos 17540] (N—photo, W—photo). Jujuy: R. E. Fries 746 [11/11/1901] (W—534226); Venturi 10129 (W—1591429). Salta: Venturi 6933 (W—1591502).

ACANTHOLIPPIA HASTULATA Griseb.

Emended synonymy: Lippia hastulata Hieron. apud Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 2: 95. 1894.

Additional bibliography: Hieron., Bol. Acad. Mac. Cienc. Cór-

doba 4: 407. 1881; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 1: 18 (1893) and 2: 95. 1894; Kuntze, Rev. Gen. Pl. 3 (2): 252. 1898; Pereyra, Bol. Univ. Nac. Tucumán Mus. Hist. Nat. 8: pl. 1 & 2. 1926; Worsdell, Ind. Lond. Suppl. 2: 58. 1941; Jacks. in Hook. f. & Jacks., Ind., Kew., pr. 2, 1: 18 (1946) and 2: 95. 1946; Anon., U. S. Dept. Agr. Bot. Subj. Index 15: 14358. 1958; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 3, 1: 18 (1960) and 2: 95. 1960; Moldenke, Phytologia 7: 330—332. 1961.

Additional illustrations: Pereyra, Bol. Univ. Nac. Tucumán Mus. Hist. Nat. 8: pl. 1 & 2. 1926.

The corolla is described as "white" on Venturi 8144. The T. Meyer 4045, distributed as A. hastulata, is actually A. riojana (Hieron.) Hieron. & Moldenke. The Hieronymus (1881) reference in the bibliography of this species is sometimes erroneously cited as page "408".

Additional citations: ARGENTINA: Jujuy: Venturi 4885 (W—1591448), 8144 (Ca—140961, W—1591400), 8300 (W—1591403).

ACANTHOLIPPIA RIOJANA (Hieron.) Hieron. & Moldenke

Emended synonymy: Lippia riojana Hieron. ex Velenovský, Vergl. Morphol. Pfl. 2: 689—690 & 1192, pl. 3, fig. 15. 1907.

Acantholippia riojana Hieron. & Moldenke ex Moldenke, Phytologia 3: 106—107. 1949. Acantholippia riojana Hieron. ex Moldenke, Suppl. List Invalid Names 1, in syn. 1941; E. J. Salisb., Ind. Kew. Suppl. 11: 2. 1953.

Additional & emended bibliography: Velenovský, Vergl. Morphol. Pfl. 2: 689—690 & 1192, pl. 3, fig. 15. 1907; Stapf, Ind. Lond. 4: 125. 1930; E. J. Salisb., Ind. Kew. Suppl. 11: 2. 1953; Moldenke, Phytologia 7: 332—333. 1961.

Illustrations: Velenovský, Vergl. Morphol. Pfl. 2: pl. 3, fig. 15. 1907.

The type specimen of this species, Hieronymus & Niederlein s. n., deposited in the herbarium of the Botanisches Museum at Berlin, was photographed there by Macbride as his type photograph number 17536, but is now destroyed.

Unfortunately, the editors of the "Index Kewensis" appear to have overlooked the original and valid publication of the binomial, Lippia riojana Hieron., by Velenovský in 1907, and this oversight caused me in 1949 to publish Acantholippia riojana as the name of a hitherto undescribed and unnamed taxon. The correct accreditation of the binomial would appear to be Acantholippia riojana (Hieron.) Hieron. & Moldenke. Velenovský's original description is as follows: "Eine höchst sonderbare Verwendung der Serialknospen findet man bei der halbstrauchartigen Pflanze aus der Familie der Verbenaceen, Lippia riojana Hieron. (Fig. 15, Taf. III), welche Hieronymus in Argentinien auf Salzlagunen entdeckt und nach Europa gebracht hat. Diese Pflanze zeigt ausserdem noch eine merkwürdige, der geringsten Wasserverdunstung dienende Einrichtung. Die Blätter sind nämlich in kleine Knäuel zusammengeballt und die einzelnen Lappen so verbogen,

dass sie wie ein Gehirn aussehen. Auf der Oberfläche sind sie glatt, derb, ohne Spaltöffnungen, nur auf der Unterseite, an der, dem Zweige angedrückten Fläche liegen sie Spaltöffnungen zwischen dichten Haaren. In der Blattachsel (a) sitzt die Knospe (o), oberhalb derselben aber noch die zweite, dritte und vierte (o', o'', o''') in aufsteigender Ordnung und in einer Reihe. Weil alle diese Knospen die ersten Blätter transversal orientiert tragen, so ist es evident, dass sie da nur Serialknospen vorstellen. Auch der Zweig (m) ist der älteste Serialspross in Hinblick auf das Stützblatt (a'). Die Zweige sind gegenständig, weil die Blätter an der Achse in dekussierten Paaren stehen. Dadurch geschieht es, dass die holzigen Zweige dieser merkwürdigen Pflanze reihenweise gleichsam von gelappten, grünlichen Warzen bedeckt sind und an den Habitus halophiler Pflanzen erinnern."

Additional citations: ARGENTINA: La Rioja: Hieronymus & Niederlein s.n. [Vinchina, 5.III.1879; Macbride photos 17536] (W—photo of type); T. Meyer 4045 (W—1909123).

ACANTHOLIPPIA SERIPHIOIDES (A. Gray) Moldenke

Additional & amended synonymy: Lippia foliosa Phil. ex Lorentz & Niederlein, Bot. Exped. Rio Negro 266--267. 1881. Lippia rubiginosa Gill. ex J. Ball, Journ. Linn. Soc. Lond. Bot. 21: 230, in syn. 1884 [not L. rubiginosa Schau., 1847]. Verbena rubiginosa Gill. ex Moldenke, Suppl. List Invalid Names 10, in syn. 1941.

Additional & amended bibliography: Hieron., Bol. Acad. Nac. Cienc. Córdoba 4: [Sert. Sanjuan.] 69 (1881) and 4: 406--408. 1881; Lorentz & Niederlein, Bot. Exped. Rio Negro 266--267. 1881; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 2: 95 & 96. 1894; Tavares, Broter. Zool. 13: 97--98, pl. 3, fig. a. 1915; Houard, Zoocéd. Pl. Amer. Sud 349, fig. 813 (a). 1933; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 2, 2: 95 & 96. 1946; E. J. Salisb., Ind. Kew. Suppl. 11: 2. 1953; Darlington & Wylie, Chromosome Atl., pr. 1, 324 & 501. 1955; Mufioz Pizarro, Espec. Plant. Descr. Philippi 110. 1960; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 3, 2: 95 & 96. 1960; Moldenke, Phytologia 7: 333--336. 1961; Darlington & Wylie, Chromosome Atl., pr. 2, 324 & 501. 1961.

Illustrations: Tavares, Broter. Zool. 13: pl. 3, fig. a. 1915; Houard, Zoocéd. Pl. Amer. Sud fig. 813 (a). 1933.

Troncoso refers to this plant as a very abundant shrub in La Pampa. The corolla is described as "white" on Sleumer 1482 and Troncoso s.n., but as "clear yellow" on Sleumer 1103. The species has been found growing on barrancas and conglomerate uplands.

It should be noted that the Philippi (1870) reference in the bibliography of this species is sometimes cited as volume "35"; Lorentz & Niederlein's work (1881) is sometimes cited as "1889". Hauman-Merck (1913) refers to this species as Lippia foliolosa and cites his no. 356 and Hier-Berg 121. He reports the plant as frequent on the plateau in Rio Negro, Argentina, with the common name there of "tomillo". He cites his no. 355 as Lippia trifida, with the same vernacular name, and says that it is more isolated

in the more sterile areas of the plateau and barrancas. I have not seen either of these collections, but I suspect that both represent A. seriphioides. The type specimen of Lippia foliolosa, which is R. A. Philippi 178, deposited in the herbarium of the Botanisches Museum at Berlin, was photographed there by Macbride as his type photograph number 17507, but is now destroyed.

Lorentz & Niederlein (1881) and Muñoz Pizarro (1960) erroneously refer to "Lippia foliosa" instead of L. foliolosa of Philippi. The latter author cites the herbarium numbers 42416 and 54803 in the Santiago, Chile, herbarium.

Houard (1933) describes the gall which is commonly found on this plant as follows: "A l'extrémité d'une tige ou à l'aisselle d'une pousse latérale....., cécidie ovoïdale ou subsphérique, de 3 mm. de long sur 2--3 mm. de large, terminée par une ou deux petites pointes à peine visibles ou bien par des restes de feuilles. Surface finement et courttement velue, verte ou rouge, plus tard grise. Paroi très mince; cavité larvaire unique avec trou d'éclosion latéral. M. C., sans cocon; adulte fin septembre--début d'octobre...Misospatha lippiae Kieff. et Jørgensen."

Additional citations: ARGENTINA: Buenos Aires: O'Donell 1447 (W--2049674); Orbea s.n. [Herb. Inst. Bot. Darwin. 18755] (W--2196450). Chubut: Sleumer 1482 (W--2056046). La Pampa: H. H. Bartlett 19936 (Au--195006, W--1904766, W--2056266); Troncoso s. n. [Herb. Inst. Bot. Darwin. 20504] (W--2340703). Mendoza: H. H. Bartlett 19193 (W--1904389), 19430 (W--1904496), 19464 (W--1904516); Lourteig 755 [Herb. Inst. Miguel Lillo 144002] (Ca); O'Donell 1051 (Ca--165394); R. A. Philippi 178 [Macbride photos 17507] (N--photo, W--photo); Sleumer 319 (B). Neuquen: Fabris 822 (W--2144766). Rio Negro: W. Fischer 12 (W--704174). San Luis: Pastore 2074 (Ca--3310). Santa Cruz: Dusén 20 (W--1133921); Ferrando 3817 (Ca--3373); Sleumer 1103 (W--2055882). Province undetermined: Kuntze s.n. [Pampas Reise, Januar 1892] (W--701565).

ACANTHOLIPPIA TRIFIDA (C. Gay) Moldenke

Emended synonymy: Lippia trifida Clos ex R. A. Phil., Anal. Univ. Chile 27: 350, in syn. 1865 [not L. trifida R. A. Phil., 1860]. Lippia trifida Remy ex F. Phil., Cat. Pl. Vasc. Chil. 218. 1881.

Additional & emended bibliography: R. A. Phil., Anal. Univ. Chile 27: 350 (1865) and 35: 193. 1870; F. Phil., Cat. Pl. Vasc. Chil. 218. 1881; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 2: 96. 1894; Durand & Jacks., Ind. Kew. Suppl. 1, pr. 1, 250. 1903; Hauman-Merck, Anal. Mus. Argent. Hist. Nat. Buenos Aires 24: 415. 1913; Hicken, Physis 2: 144. 1916; Molino, Physis 5: 21. 1921; Stapf, Ind. Lond. 4: 125. 1930; Durand & Jacks., Ind. Kew. Suppl. 1, pr. 2, 250. 1941; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 2, 2: 96. 1946; Acevedo de Vargas, Bol. Mus. Nac. Hist. Nat. Chile 25: 36--38, fig. 1A. 1951; E. J. Salisb., Ind. Kew. Suppl. 11: 2. 1953; Acevedo de Vargas, Biol. Abstr. 28: 904. 1954;

Hocking, Dict. Terms Pharmacog. 128. 1955; Durand & Jacks., Ind. Kew. Suppl. 1, pr. 3, 250. 1959; G. Taylor, Ind. Kew. Suppl. 12: 7. 1959; Muñoz Pizarro, Espec. Plant. Descr. Philippi 110. 1960; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 3, 2: 96. 1960; Moldenke, Phytologia 7: 336—338. 1961.

Illustrations: Sanzin, Anal. Soc. Cient. Argent. 88: 101. 1919; Acevedo de Vargas, Bol. Mus. Nac. Hist. Nat. Chile 25: 36, fig. 1A. 1951.

Acevedo de Vargas (1951) avers that this plant is an Aloysia and calls it Aloysia gracilis. It is mentioned by Hauman-Merck (1913) as "Lippia trifida Gay" and he cites his no. 355 which he says represents plants "isolated in a more sterile area of the plateau and barrancas" of Rio Negro, Argentina. This is most surely a misidentification. The plant referred to by him was probably A. seriphioides (A. Gray) Moldenke. Philippi (1865) refers to Lippia trifida Clos in synonymy, which he says is his Lippia microphylla, now called Acantholippia deserticola (R. A. Phil.) Moldenke. The Philippi (1896) reference in the bibliography, by the way, is often cited as "1895" [e.g., by Durand & Jackson (1903)], while the Molino (1921) reference was mis-cited as volume "9" in Phytologia 7: 336 (1961). Hicken (1916) cites A. trifida from Tarapacá in Chile and from Mendoza, San Luis, and Rio Negro in Argentina, but I think that these records are all based on misidentifications. I know the species only from Atacama, Chile. The vernacular name, "tomillo", has been recorded for it. Hocking (1955) reports that the herbage is rich in thymol. An isotype of A. trifida, C. Gay s.n., deposited in the herbarium of the Conservatoire et Jardin Botaniques at Geneva, was photographed there by Macbride as his type photograph number 24673.

The I. M. Johnston 4850 & 4877, distributed as Lippia trifida, are actually Aloysia fonckii (R. A. Phil.) Moldenke, while Werdermann 184 is Aloysia reichii Moldenke.

Additional citations: CHILE: Atacama: C. Gay s.n. [Macbride photos 24673] (W—photo of isotype).

ADDITIONAL NOTES ON THE GENUS AVICENNIA. IV

Harold N. Moldenke

AVICENNIACEAE Endl.

Additional synonymy: Avicenniaceae (Endl.) Schnitzl. apud Airy-Shaw in Willis, Dict. Flow. Pl., ed. 7, 109. 1966.

Additional & emended bibliography: Adans., Fam. Pl. 2: 12, 200, & 201. 1763; H.B.K., Nov. Gen. & Sp. Pl., ed. folio, 2: 228—230 (1817) and ed. quart., 2: 283—285. 1818; A. Cunn., Ann. Nat. Hist., ser. 1, 1: 461. 1838; D. Dietr., Syn. Pl. 3: 372 & 619.

- 1843; Benth., Bot. Voy. Sulphur 155. 1846; Aschers. in Schweinf., Beitr. Fl. Aethiop. 1: 118 & 278. 1867; A. Gray, Syn. Fl. N. Am., ed. 1, 2 (1): 334 & 340—341. 1878; Boiss., Fl. Orient. 4: 536—537. 1879; A. Gray, Syn. Fl. N. Am., ed. 2, 2 (1): 334 & 340—341. 1886; Barnhart, Bull. Torrey Bot. Club 29: 590. 1902; Prain, Beng. Pl., ed. 1, 2: 824 & 838. 1903; Volkens, Notizbl. Bot. Gart. Berl. 5, App. 22 (2): 35—36. 1909; Craib, Contrib. Fl. Siam Dicot. 168. 1912; Bournet, Arch. Pharm. 251: 351. 1913; R. T. Baker, Journ. & Proc. Rot. Soc. N. S. Wales 49: 257—281, pl. 27—48. 1915; Haines, Bot. Bihar & Orissa 4: 704 & 724—725. 1922; Gamble, Fl. Presid. Madras 6: 1086 & 1105—1106. 1924; H. J. Lam in Engl., Bot. Jahrb. 59: 29. 1924; J. G. Wats., Malay. Forest. Rec. 6: 1, 3, 56—69, 99, 101, 114—118, 128, 135, 137, 150, 178, & 192, pl. 2, 26—33, & 47. 1928; Watt & Breyer-Brandwijk, Med. & Poison. Pl. S. Afr., ed. 1, 155. 1932; V. J. Champ., Proc. Linn. Soc. Lond. 152: 228—233, fig. 1—4. 1940; Cranwell, Rec. Auckl. Inst. & Mus. 2: 296. 1942; Trochain, Trav. Toulous. Univ. Lab. Forest. 1 [Art. Divers.] 3 (19): 1—11. 1942; Trochain & Dulau, Bull. Toulous. Soc. Hist. Nat. 77: 271—281. 1942; J. H. Willis, Victorian Nat. 61: 40—41. 1944; Erdtman, Svensk Bot. Tidsk. 39: 282 & 283, fig. 2. 1945; J. Hutchinson, Botanist in South. Afr. 553. 1946; Bharucha & Shirke, Journ. Bombay Univ. B, new ser., 15 (5): 1—14. 1947; Frison, Bull. Agr. Congo Belg. 39: 587—592. 1948; Faegri & Iversen, Text-book Mod. Pollen Analys. 194 & 219. 1950; Lombardo, Invent. Pl. Cult. Montevide. [10]. 1954; Angely, Fl. Paran. 7: 6—8. 1957; Anon., U. S. Dept. Agr. Bot. Subj. Index 15: 14353. 1958; Karrer, Konstit. & Vork. Organ. Pflanzenst. 489. 1958; Aubrev., Fl. For. Cot. Iv., ed. 2, 3: 234, pl. 338. 1959; Moldenke, Biol. Abstr. 33: 3171 (1959) and 35: 983 & 2177. 1960; Angely, Liv. Gen. Bot. Bras. 8. 1960; Allan, Fl. N. Zeal. 1: 960—961. 1961; M. R. Henderson, Common Malay. Wildfls. 39. 1961; Angely, Fl. Paran. 17: 10, 11, & 15. 1961; Moldenke, Biol. Abstr. 36: 2843 (1961) and 40: 250 & 1560. 1962; Cuf., Bull. Jard. Bot. Brux. 32: Suppl. 803. 1962; Angely, Fl. Bacia Paran. 22: 25. 1962; Watt & Breyer-Brandwijk, Med. & Poison. Pl. S. Afr., ed. 2, 1047 & 1360. 1962; Hocking, Excerpt. Bot. A.4: 591 (1962). A.5: 45 (1962), and A.6: 454. 1963; Prain, Bengal Pl., ed. 2, 2: 626 & 1009. 1963; Moldenke, Biol. Abstr. 42: 1517. 1963; Soukup, Biota 4: 320 (1963) and 5: 194. 1964; Hocking, Excerpt. Bot. A.8: 190. 1964; Angely, Bibl. Veg. Paran. 195 & 197. 1964; Anon., Assoc. Etud. Tax. Fl. Afr. Trop. Bull. 15: 23. 1964; Anon., Assoc. Etud. Tax. Fl. Afr. Trop. Index 1963: 9. 1964; Van Steenis, Fl. Males. Bull. 19: 1203. 1964; C. J. Lyon, Biol. Abstr. 45: 8025. 1964; Klein, Anais XV Congr. Soc. Bot. Bras. 260. 1964; H. D. Jordan, Journ. Appl. Ecol. 1: 209—212. 1964; Anon., Biol. Abstr. 45 (23): B.13, B.14, B.116, B.117, B.125, B.127, & B.129 (1964) and 46 (3): B.14, B.118, B.121, & B.131. 1965; R. C. Cook, Leaders Am. Sci., ed. 6, 414. 1965; Gooding, Loveless, & Proctor, Fl. Barbados 365 & 465. 1965; Naurois & Roux, Bull. Inst. Fr. Afr. Noire A.27: 854. 1965; Anon., Assoc. Etud. Fl. Afr. Trop. Index 1964: 10. 1965; Hocking, Excerpt. Bot. A.8: 227. 1965; D. R. Harris, Univ. Calif. Publ. Geogr. 18: [Pl. Anim. & Man Outer Leeward Isls.]

143. 1965; Moldenke, *Phytologia* 12: 6. 1965; Moldenke, *Biol. Abstr.* 46 (1): 1012. 1965; Datta, *Handb. Syst. Bot.* 181, 183, 339, 360, & 411. 1965; Humbert, *Trav. Sect. Scient. & Tech. Inst. Franç. Pond. Hors Ser.* 6: 77. 1965; Arora & Aggarwal, *Journ. Indian Bot. Soc.* 44: 317, 318, 323, & 325. 1965; Schnell, *Adansonia* 5: 322—326, pl. 1 & 2. 1965; Biebel & Kinzel, *Oesterr. Bot. Zeit.* 112: 56—93. 1965; Maheshwari & Singh, *Dict. Econ. Pl. India* 18. 1965; Gaussen & al., *Trav. Sect. Scient. & Tech. Inst. Franç. Pond. Hors Ser.* 7: 78 & 96. 1966; Airy-Shaw in Willis, *Dict. Flow. Pl.*, ed. 7, 109, 146, 375, 515, 546, 948, 1009, & 1165. 1966; Hemming, *Proc. Linn. Soc. Lond. Bot.* 177 (2): 235. 1966; Bowman, *Galap.* 192 & 301. 1966; Tanabe, *Pl. Jap. Environ.* 1: 2. 1966; Riegel, *Diss. Abstr.* 26: 6648—6649. 1966; Studholme & Philipson, *New Zeal. Journ. Bot.* 4: 355—365. 1966; C. A. Sm., *Common Names S. Afr. Pl.* 332, 500, & 600. 1966; H. P. French, *Ibis* 108: 423—424. 1966; Gómez Pompa, *Estud. Bot. Reg. Misantla* 93. 1966; Braga de Andrade, *Univ. São Paulo Fac. Filos. Bol.* 305, *Bot.* 22: 34. 1966; T. C. Whitmore, *Guide Forests Brit. Solomon Isls.* 21. 1966; Anon., *Biol. Abstr.* 47 (23): S.17. 1966; Stace, *New Phytol.* 65: 304—318. 1966; Stace, *Biol. Abstr.* 47: 9875. 1966; Rao, Aggarwal, & Mukherjee, *Bull. Bot. Surv. India* 8: 61, 62, 65, & 66. 1966; Erdtman, *Pollen Morph. & Pl. Tax.* 448. 1966; G. L. Davis, *Syst. Embryol. Angiosp.* 271—272. 1966; Anon., *Assoc. Etud. Tax. Fl. Afr. Trop. Index* 1966: 9. 1967; W. G. Burger, *Pam. Flow. Pl. Ethiop.* 116. 1967; Van Steenis-Kruseman, *Fl. Malcs. Bull.* 4: xlix. 1967; J. Jiménez, *Archiv. Bot. & Biogeog. Ital.* 43: 4. 1967; Moldenke, *Phytologia* 15: 71—72. 1967; Moldenke, *Résumé Suppl.* 15: 1, 2, 4—6, 8, & 16. 1967; Jamieson & Reynolds, *Trop. Pl. Types* 159, fig. 87. 1967; Riegel, *Biol. Res. Ind. Tit.* 1967: 2291. 1967; Kroha, *Biol. Abstr.* 48: 6872. 1967; Anon., *Biol. Abstr.* 48 (15): S.18 & S.177. 1967; Studholme & Philipson, *Biol. Abstr.* 48: 645. 1967; Jordan, *Biol. Abstr.* 48: 383. 1967; R. P. French, *Biol. Abstr.* 48: 1482; Sauer, *Plants & Man Seychelles* 84, 89, & 102. 1967.

It is worthy of note that in the bibliography given above this family is accepted as a valid one by many authors. Even Ascherson (1867) and Cufodontis (1962) recognize it. Burger (1967) states that it differs from the Verbenaceae in the structure of the ovary and in its seaside habit (which is not strictly true, since Clerodendrum inerme and Vitex trifolia var. simplicifolia also have a characteristic "seaside habit"; however, they do not grow in the mangrove swamps as characteristically as does Avicennia, nor do they possess the unusual wood structure of the latter genus). Airy-Shaw (1966) characterizes the Avicenniaceae as follows: "Dicots 2/15 trop. coasts. Shrubs or small trees, often grayish or yellow tomentose. Lvs. opp., simple, ent., exstip. Infl. cymose or thyrself., condensed or spicif., term. and axill., bracteate. Fls. small, yellowish, reg., ♂ (5) imbr.; C (4), imbr.; A 4; G (4), with 1-ovulate imperf. loc. and short bifid style. Fr. a broad compr. ovoid or spher. bivalved 1-seeded caps. Only genus Avicennia. Perhaps related to Salvadoraceae."

AVICENNIA L.

Additional & emended synonymy: Donatia Loebl., Iter Hisp. 193, in syn. 1758 [not Donatia Bert., 1849, nor J. R. & G. Forst., 1776]. Halodendron Roem. & Schult., Syst. Veg. 3: 485. 1818 [not Halodendron P. DC., 1825]. Bontia P. Br. ex Airy-Shaw in Willis, Dict. Flow. Pl., ed. 7, 146. 1966.

The Lam (1924) reference in the bibliography of this group is sometimes cited as "1925", but the latter date is merely the title page date for the volume; the page in question appeared in 1924. The Boissier (1879) reference is often dated "1875", but only pages 1--280 were issued in 1875; pp. 281--1276 did not appear in print until 1879. The J. G. Watson (1928) reference in the bibliography is often cited as "J. G. Wats., Mangrove Forests Malay Penins." The H.B.K. reference dates have been authenticated by Barnhart (1902).

Airy-Shaw (1966) correctly places this genus in the family Avicenniaceae, and says that there are 14 species in the genus, inhabiting warm regions, constituents of mangrove vegetation; they have aerial roots projecting out of the mud like Sonneratia; the seeds germinate in the fruit. He regards Bontia L. as strictly a genus in the Myoporaceae, not distinguishing between the "Bontia L." of 1735 and that of 1758.

The Donatia of Bertero, referred to in the synonymy above, is actually a synonym of Lastarriaea in the Polygonaceae, while that of the Forsters is the type genus of the Donatiaceae, and the Halodendron of DeCandolle is a synonym of Halimodendron Fisch. in the Fabaceae.

AVICENNIA AFRICANA P. Beauv.

Additional bibliography: Volkens, Notizbl. Bot. Gart. Berl. 5, App. 22 (2): 35--36. 1909; Trochain & Dulau, Trav. Toulous. Univ. Lab. Forest. 1 [Art. Divers.] 3 (19): 1--11, fig. 1. 1942; Trochain & Dulau, Bull. Toulous. Soc. Hist. Nat. 77: 271--281. 1942; Frison, Bull. Agr. Congo Belg. 39: 587--592. 1948; Anon., U. S. Dept. Agr. Bot. Subj. Index 15: 14353. 1958; Jordan, Journ. Appl. Ecol. 1: 209--212. 1964; Schnell, Adansonia 5: 324--326. 1965; Erdtman, Pollen Morph. & Pl. Tax. 448. 1966; Jamieson & Reynolds, Trop. Pl. Types 159. 1967; Jordan, Biol. Abstr. 48: 383. 1967; Moldenke, Phytologia 15: 71. 1967; Moldenke, Résumé Suppl. 15: 5 & 6. 1967.

Additional illustrations: Trochain & Dulau, Trav. Toulous. Univ. Lab. Forest. 1 [Art. Divers.] 3 (19): 5, fig. 1. 1942.

Erdtman (1966) examined the pollen of Afzelius s.n. from Sierra Leone and found it to be (2)--3-colporoidate, 32 x 26 μ , the sexine reticulate, as thick as the nexine. In A. germinans he found the grain to be 39 x 29 μ , with the sexine considerably thicker than the nexine.

AVICENNIA ALBA Blume

Additional & emended bibliography: Prain, Beng. Pl., ed. 1, 2:

838. 1903; Haines, Bot. Bihar & Orissa 4: 725. 1922; Gamble, Fl. Presid. Madras 6: 1105 & 1106. 1924; J. G. Wats., Malay. Forest Rec. 6: 61, 62, 67, 69, 116, 118, & 150, pl. 30 & 31. 1928; Prain, Bengal Pl., ed. 2, 2: 626. 1963; Moldenke, Phytologia 15: 71. 1967; Moldenke, Résumé Suppl. 15: 8 & 16. 1967.

Emended illustrations: J. G. Wats., Malay. Forest Rec. 6: pl. 30 & 31. 1928.

Additional citations: THAILAND: Hansen & Smitinand 12313 (Cp, Rf).

AVICENNIA GERMINANS (L.) L.

Emended synonymy: Avicennia tomentosa var. cumanensis H.B.K., Nov. Gen. & Sp. Pl., ed. folio, 2: 229--230. 1817. Avicennia tomentosa var. campechensis H.B.K., Nov. Gen. & Sp. Pl., ed. folio, 2: 230. 1817. Avicennia tomentosa var. guayaquilensis H.B.K., Nov. Gen. & Sp. Pl., ed. folio, 2: 230--231. 1817.

Additional & emended bibliography: H.B.K., Nov. Gen. & Sp. Pl., ed. folio, 2: 229--231 (1817) and ed. quart., 2: 283--285. 1818; A. Cunn., Ann. Nat. Hist., ser. 1, 1: 461. 1838; A. Gray, Syn. Fl. N. Am., ed. 1, 2 (1): 341 (1878) and ed. 2, 2 (1): 341. 1886; Barnhart, Bull. Torrey Bot. Club 29: 590. 1902; Bournot, Arch. Pharm. 251: 351. 1913; V. J. Chapm., Proc. Linn. Soc. Lond. 152: 228--233, fig. 1--4. 1940; Trochain & Dulau, Trav. Toulous. Univ. Lab. Forest. 1 [Art. Divers.] 3 (19): 1--11. 1942; Trochain & Dulau, Bull. Toulous. Soc. Hist. Nat. 77: 271--281. 1942; V. J. Chapm., Journ. Linn. Soc. Lond. 52: 407--534, text figs. 1--169, fig. 1--3, pl. 16--20. 1944; Karrer, Konstit. & Vork. Organ. Pflanzenst. 489. 1958; Jordan, Journ. Appl. Ecol. 1: 209--212. 1964; Schnell, Adansonia 5: 322--326, pl. 1 & 2. 1965; Bieble & Kinzel, Oesterr. Bot. Zeit. 112: 56--93. 1965; D. R. Harris, Univ. Calif. Publ. Geogr. 18: [Pl. Anim. & Man Outer Leeward Isls.] 52 & 143. 1965; Erdtman, Pollen Morph. & Pl. Tax. 448. 1966; Gómez Pompa, Estud. Bot. Reg. Misantla 93. 1966; Moldenke, Phytologia 15: 72. 1967; Moldenke, Résumé Suppl 15: 1, 2, 4, & 16. 1967; Jamieson & Reynolds, Trop. Pl. Types 159. 1967; Kroha, Biol. Abstr. 48: 6872. 1967; Anon., Biol. Abstr. 48 (15): S.18 & S.177. 1967; Jordan, Biol. Abstr. 48: 383. 1967.

Additional illustrations: V. J. Chapm., Proc. Linn. Soc. Lond. 152: 229 & 232, fig. 1--4. 1940; Schnell, Adansonia 5: 322 & 323, pl. 1 & 2. 1965.

Bournot (1913) reports the presence of lapachol, $C_{15}H_{14}O_3$, in this species. Erdtman (1966) examined the pollen of Gaumer 619 from Mexico and found it (2)--3-colporoidate, 39 x 29 mu, the sexine reticulate, considerably thicker than the nexine. In A. africana he found the grains to be only 32 x 26 mu, with the sexine merely as thick as the nexine.

Wiggins & Porter describe A. germinans as it occurs on the Galapagos Islands as an arborescent shrub, 2.5--4 m. tall, with a flattened crown, or a tree, 6 m. tall near the beach, but taller inland around the lagoons, with a smooth to flaky brownish-gray

bark on a trunk to 30 cm. in diameter. Harris (1965) reports that "all 4 New World mangroves" grow on the leeward coasts of Antigua, Barbuda, and Anguilla. Gómez Pompa (1966) reports the species as growing along with Brosimum in Mexico.

It should be noted that the H.B.K. reference dates given in the emended synonymy and in the bibliography above have been authenticated by Barnhart (1902).

Additional citations: FLORIDA: Indian River Co.: Curtiss 1972 [fls. July] (Ms--7205, Ms--30957), 1972 [fr. Sept.] (Ms--7205, Ms--30957). Manatee Co.: Nash 2450 (Ms--30958). County undetermined: A. P. Garber s.n. [Florida, 1877] (Ms--30956). GALAPAGOS ISLANDS: Albemarle: Wiggins & Porter 216 (Ac). Charles: Wiggins & Porter 517 (Rf). James: Wiggins & Porter 287 (Rf). Narborough: Wiggins & Porter 199 (Ac), 201 (Rf).

AVICENNIA LANATA Ridl.

Additional & emended bibliography: J. G. Wats., Malay. Forest Rec. 6: 63, 64, 67, 69, 99, 101, & 117, pl. 32 & 33. 1928; Moldenke, Phytologia 14: 328. 1967.

Additional illustrations: J. G. Wats., Malay. Forest Rec. 6: pl. 32 & 33. 1928.

AVICENNIA MARINA (Forsk.) Vierh.

Additional synonymy: Avicennia tomentosa Wall. ex Boiss., Fl. Orient. 4: 536--537, in syn. 1875. Avicennia marina Vierh. ex Moldenke, Résumé 235, in syn. 1958; C. A. Sm., Common Names S. Afr. Pl. 600. 1966.

Additional & emended bibliography: Boiss., Fl. Orient. 4: 536--537. 1879; R. T. Baker, Journ. & Proc. Roy. Soc. N. S. Wales 49: 257--381, pl. 27--48. 1915; Gamble, Fl. Presid. Madras 6: 1105 & 1106. 1924; J. G. Wats., Malay. Forest Rec. 6: 3, 59, 60, 66, 68, 101, 115--118, & 137, pl. 2, 28, 29, & 47. 1928; Watt & Breyer-Brandwijk, Med. & Poison. Pl. S. Afr., ed. 1, 155. 1932; Trochain & Dulau, Trav. Toulous. Univ. Lab. Forest. 1 [Art. Divers.] 3 (19): 6. 1942; J. H. Willis, Victorian Nat. 61: 40--41. 1944; Allan, Fl. N. Zeal. 1: 961. 1961; Watt & Breyer-Brandwijk, Med. & Poison. Pl. S. Afr., ed. 2, 1047 & 1360. 1962; Humbert, Trav. Sect. Scient. & Tech. Inst. Franç. Pond., ser. 6, Not. Carte Madag. 77. 1965; Hemming, Proc. Linn. Soc. Lond. Bot. 177 (2): 235. 1966; Tanabe, Pl. Jap. Environ. 1: 2. 1966; Erdtman, Pollen Morph. & Pl. Tax. 448. 1966; C. A. Sm., Common Names S. Afr. Pl. 332, 500, & 600. 1966; G. L. Davis, Syst. Embryol. Angiosp. 271. 1966; Moldenke, Phytologia 15: 72. 1967; Moldenke, Résumé Suppl. 15: 16. 1967.

Additional illustrations: J. G. Wats., Malay. Forest Rec. 6: pl. 2, 28, 29, & 47. 1928; Tanabe, Pl. Jap. Environ. 1: 2 [in color]. 1966.

The Boissier reference (1879) in the synonymy and bibliography above is sometimes cited as "1875", but the pages indicated were not actually published until 1879. It should also be noted here that the "A. officinalis Auct." of Allan is actually A. marina

var. resinifera (Forst.) Bakh.

Erdtman (1966) misidentifies this species as A. officinalis and describes its pollen as 3-colporate, spheroidal (33 μ); the sexine as thick as the nexine (cf. retipilariate). He bases this description on the pollen of Schlieben 5787 from Tanganyika.

Additional citations: PORTUGUESE EAST AFRICA: Mozambique: Torre & Paiva 11484 (Z). THAILAND: Hansen & Smitinand 12310 (Cp, Rf); Larsen, Smitinand, & Warncke 1220 (Rf).

AVICENNIA MARINA var. ACUTISSIMA Stapf & Moldenke

Additional synonymy: Avicennia marina var. acutissima Stapf & Moq. ex Rao, Aggarwal, & Mukherjee, Pull. Bot. Surv. India 8: 65, sphalm. 1966.

Additional bibliography: Moldenke, Phytologia 7: 225—226. 1960; Rao, Aggarwal, & Mukherjee, Bull. Bot. Surv. India 8: 65. 1966; Moldenke, Résumé Suppl. 15: 16. 1967.

Rao, Aggarwal, & Mukherjee (1966) cite Rao 2062 as this variety.

AVICENNIA MARINA var. RESINIFERA (Forst.) Bakh.

Additional synonymy: Avicennia officinalis Auct. ex Allan, Fl. N. Zeal. 1: 961, in syn. 1961 [not A. officinalis Auct. ex Cuf., 1962].

Additional bibliography: A. Cum., Ann. Nat. Hist., ser. 1, 1: 461. 1838; R. T. Baker, Journ. & Proc. Roy. Soc. N. S. Wales 49: 257—281, pl. 27—48. 1915; J. G. Wats., Malay. Forest Rec. 6: 115. 1928; Allan, Fl. N. Zeal. 1: 961. 1961; Guillaumin, Thorne, & Virot, Univ. Iowa Stud. Nat. Hist. 20 (7): 45. 1965; T. C. Whitmore, Guide Forests Brit. Solomon Isls. 168. 1966; Studholme & Philipson, New Zeal. Journ. Bot. 4: 355—365. 1966; Studholme & Philipson, Biol. Abstr. 48: 645. 1967; Moldenke, Phytologia 11: 331—335. 1967; Jamieson & Reynolds, Trop. Pl. Types 159, fig. 87. 1967.

Additional illustrations: R. T. Baker, Journ. & Proc. Roy. Soc. N. S. Wales 49: pl. 27—48. 1915; Jamieson & Reynolds, Trop. Pl. Types fig. 87 [as A. officinalis]. 1967.

Studholme & Philipson (1967) report that the secondary thickening in the wood of this species is due to a succession of cambia, each of which functions in a normal manner, but for a limited time. The first of these supernumerary cambia arises by division of the inner derivatives of the preceding cambium. In another genus with included phloem, Heimerliodendron, the secondary thickening is distinctive.

It should be noted here that the A. officinalis Auct. of Cufodontis, mentioned in the synonymy above, is a synonym of typical A. marina (Forsk.) Vierh. The Rechinger & Rechinger 4927 collection is cited by Whitmore (1966) as A. officinalis L. in error.

Additional citations: NEW ZEALAND: North Island: K. Wood 31769 (Ms—43073). Rangototo Island: J. S. Edwards 31838 (Ms—46125).

AVICENNIA MARINA var. RUMPHIANA (H. Hallier) Bakh.

Additional bibliography: Moldenke, Phytologia 14: 331, 333, & 335. 1967.

AVICENNIA OFFICINALIS L.

Additional & emended bibliography: N. J. Anderss., Vet. Akad. Handl. Stockh. 1853: 201. 1854; N. J. Anderss., Galap. Veg. 82. 1859; Boiss., Fl. Orient. 4: 537. 1879; B. L. Robinson, Proc. Am. Acad. 38: 194. 1902; Prain, Bengal Fl., ed. 1, 838. 1903; C. B. Clarke in J. Schmidt, Bot. Tidsskr. 26: 175. 1904; Volkens, Notizbl. Bot. Gart. Berl. 5, App. 22 (2): 36. 1909; Craib, Contrib. Fl. Siam Dicot. 168. 1912; R. T. Baker, Journ. & Proc. Roy. Soc. N. S. Wales 49: 257—281, pl. 27—48. 1915; Haines, Bot. Bihar & Orissa 4: 725. 1922; Gamble, Fl. Presid. Madras 6: 1105 & 1106. 1924; J. G. Wats., Malay. Forest Rec. 6: 57, 58, 66, 68, 99, 115, 116, & 128, pl. 26 & 27. 1928; Watt & Breyer-Brandwijk, Med. & Poison. Pl. S. Afr., ed. 1, 155. 1932; Erdtman, Svensk Bot. Tidsk. 39: 282 & 283, fig. 2. 1945; Bharucha & Shirke, Journ. Bombay Univ. B, new ser., 15 (5): 1—14. 1947; V. S. Rao, Journ. Indian Bot. Soc. 31: [297] & 310—313, fig. 59—63. 1952; S. A. Khan, Pakist. Journ. Forest. 11: 43—45. 1961; Allan, Fl. N. Zeal. 1: 961. 1961; Watt & Breyer-Brandwijk, Med. & Poison. Pl. S. Afr., ed. 2, 1047 & 1360. 1962; Rao, Aggarwal, & Mukherjee, Bull. Bot. Surv. India 5: 143—146. 1963; Prain, Bengal Fl., ed. 2, 2: 626. 1963; Maheshwari & Singh, Dict. Econ. Pl. India 18. 1965; Datta, Handb. Syst. Bot. 181 & 183. 1965; Humbert, Trav. Sect. Scient. & Tech. Inst. Franç. Pond. Hors Ser. 6: 77. 1965; Arora & Aggarwal, Journ. Indian Bot. Soc. 44: 317, 318, & 325. 1965; Guillaumin, Thorne, & Virot, Univ. Iowa Stud. Nat. Hist. 20 (7): 45. 1965; T. C. Whitmore, Guide Forests Brit. Solomon Isls. 168. 1966; Gausson & al., Trav. Sect. Scient. & Tech. Inst. Franç. Pond. Hors Ser. 7: 78 & 96. 1966; Erdtman, Pollen Morph. & Pl. Tax. 448. 1966; C. A. Sm., Common Names S. Afr. Pl. 500 & 600. 1966; G. L. Davis, Syst. Embryol. Angiosp. 271. 1966; Moldenke, Phytologia 14: 328—335. 1967; Van Steenis-Kruseman, Fl. Males. Bull. 4: xlviii. 1967; Moldenke, Résumé Suppl. 15: 8 & 16. 1967; Jamieson & Reynolds, Trop. Pl. Types 159. 1967.

Additional & emended illustrations: J. G. Wats., Malay. Forest Rec. 6: pl. 26 & 27. 1928; Erdtman, Svensk Bot. Tidsk. 39: 282, fig. 2. 1945; V. S. Rao, Journ. Indian Bot. Soc. 31: 310, fig. 59—63. 1952; S. A. Khan, Pakist. Journ. Forest. 11: 45 [in color]. 1961.

Rao, Aggarwal, & Mukherjee (1963) record this species from Pumurichan and Krusadi Islands, India. Clarke (1904) regards Bontia germinans L. as a synonym of A. officinalis. Khan (1961) records the vernacular name "timar" applied to this plant in Pakistan. Datta (1965) says that the bark is used in tanning and the green fruit is used as a poultice in the treatment of boils. Arora & Aggarwal (1965) state that A. officinalis grows along with Rhizophora mucronata, Aegiceras corniculatum, and Ceriops tagal in seaside mangrove forests and also dominates the back-

waters on gray soil of mostly sand.

The A. tomentosa Wall., given as a synonym by Boissier (1879), actually belongs in the synonymy of typical A. marina (Forsk.) Vierh. The Boissier reference is often cited as "1875", but the pages involved were not actually published until 1879. The Rechinger 4927, cited by Whitmore (1966), is actually A. marina var. resinifera (Forst.) Bakh. It is also very probable that the R. T. Baker reference (1915) and illustration refer to A. marina var. resinifera rather than to A. officinalis. Erdtman (1966) describes the pollen of A. marina under the name of "A. officinalis".

Guillaume, Thorne, & Virot (1965) cite Thorne 28269 from New Caledonia, but the species does not occur there. They are doubtless referring to A. marina (Forsk.) Vierh. or its variety resinifera (Forst.) Bakh. The K. Wood 31769 and J. S. Edwards 31838, distributed as A. officinalis, are actually A. marina var. resinifera.

AVICENNIA SCHAUERIANA Stapf & Leechman

Additional synonymy: Avicennia schaueriana Stapf & L. ex Klein, Annals XV Congr. Soc. Bot. Bras. 260, sphalm. 1964.

Additional bibliography: Klein, Annals XV Congr. Soc. Bot. Bras. 260. 1964; Moldenke, Phytologia 14: 335—336. 1967.

ADDITIONAL NOTES ON THE GENUS VERBENA. IV

Harold N. Moldenke

VERBENA [Dorst.] L.

Additional & amended synonymy: Obletia Lemonn. ex Rozier, Introd. Obs. Phys. Hist. Nat. 1: 367. 1773. Billardiera Moench, Meth. Pl. 369. 1794 [not Billardiera Sm., 1793, nor Vahl, 1796]. Shuttelworthia Steud., Nom. Bot., ed. 2, 2: 575, sphalm. 1841. Aubletia Jacq. apud Wittstein, Etymolog.-bot. Handwörterb. 85. 1852 [not Aubletia Gaertn., 1788, nor Lour., 1790, nor Neck., 1790, nor Rich., 1807, nor Schreb., 1789]. Obletia Rozier apud Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 2: 323, in syn. 1894. Glanduria Troncoso, Biol. Abstr. 46: 7724 (1965) and 46 (2): B.53 & B.128, sphalm. 1965. Obletia "Lemonn. ex Rozier" apud Airy-Shaw in Willis, Dict. Flow. Pl., ed. 7, 784, in syn. 1966.

Additional & amended bibliography: Adans., Fam. Pl. 2: 12, 196, & 198. 1763; Retz., Svenska Vet. Akad. Stockh. Nya Handl. 34: 143—146, pl. 5. 1773; H.B.K., Nov. Gen. & Sp. Pl., ed. fo-

lio, 2: 220—224, pl. 133—137 (1817), ed. quart., 2: pl. 133—137 (1817), and ed. quart., 2: 272—277. 1818; Bischoff, Handb. Bot. Term. 1: Erk. Taf. [9], pl. 22, fig. 651. 1830; Moris, Ann. Stor. Nat. 4: 39 & 59—60. 1830; Lem. & Chauv., Traité Cult. Geran. 1—152. 1842; D. Dietr., Syn. Pl. 3: 371. 1843; Benth., Bot. Voy. Sulphur 152—153. 1846; Bischoff, Organ. Syst. Art. Regist. 23. 1849; Lecoq, Ann. Scient. Litt. & Indust. Auverg. 25: 145—147. 1852; N. J. Anderss., Vet. Akad. Handl. Stockh. 1853: 199—200. 1854; Schnitzl., Icon. Fam. Nat. Reg. Veg. 137, fig. 2—22 & 30. 1856; N. J. Anderss., Galap. Veg. 81. 1859; E. S. Rand, Trans. Mass. Hort. Soc. 1859: 42—49. 1860; Prior, Pop. Names Brit. Pl. 206. 1863; Chaté, Des Verv. 1—63. 1865; A. Gray, Syn. Fl. N. Am., ed. 1, 2 (1): 333 & 335—338. 1878; Hieron., Bol. Acad. Nac. Cienc. Córdoba 3 (4): [Sert. Patag.] 59. 1880; Hieron., Bol. Acad. Nac. Cienc. Córdoba 4: [Sert. Sanjuan.] 66—69 (1881) and 4: 404—409. 1881; Lorentz & Niederlein, Bot. Exped. Rio Negro 263—266, pl. 12. 1881; J. E. Gonzalez, Revist. Cientif. Mex. 1 (14): 13 & 17. 1881; A. Gray, Syn. Fl. N. Am., ed. 2, 2 (1): 333 & 335—338. 1886; H. Fischer, Beitr. Vergl. Morphol. Pollenk. 46. 1890; Bagnall, Fl. Warwicksh. 200—201 & 518. 1891; A. S. Hitchc., Ann. Rep. Mo. Bot. Gard. 4: 117. 1893; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 1: 249, 306, 877, & 1032 (1893) and 2: 29. 1894; G. H. Buek, Wild Fls. Am. 1 (1): [11—12], pl. 9. 1894; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 2: 895, 1161, 1178—1180, & 1248. 1895; Robinson & Greenm., Am. Journ. Sci. 150 [ser. 3, 50]: 142—143 & 147. 1895; Osten, Abh. Naturw. Ver. Brem. 14: 264. 1898; Barnhart, Bull. Torrey Bot. Club 29: 590. 1902; Prain, Bengal Pl., ed. 1, 1: 65 (1903) and 2: 823 & 826. 1903; S. N. F. Sanford, Rhodora 6: 88—90. 1904; C. B. Clarke in J. Schmidt, Bot. Tidsskr. 26: 171. 1904; Schaffner, Ohio Nat. 7 [Contrib. Bot. Lab. Ohio State Univ. 27]: 31—34. 1906; Bornm., Beih. Bot. Centralbl. 22 (2): 117. 1907; Duthie, Fl. Upper Gang. Plain 2: 215 & 217—218. 1911; P. B. Kennedy, Annot. List Wild Fls. Calif. 112. 1917; Holste, Merck's Jahresber. 31—32: 513. 1917—1918; Holste, Zeitschr. Exp. Path. Ther. 19: 483. 1918; Kanda, Bot. Gaz. 69 [Contrib. Hull Bot. Lab. 257]: 54—71, pl. 6—9. 1920; E. D. Merr., Philip. Journ. Sci. 19: 376. 1921; Haines, Bot. Bihar & Orissa 4: 704 & 707—708. 1922; Gamble, Fl. Presid. Madras 6: 1085 & 1106. 1924; Molliard, Feuille Nat. 45: 41—44. 1924; W. J. Bean, Garden 88: 184. 1924; L. H. Bailey, Man. Cult. Pl., ed. 1, pr. 1, 628—630 & 848—849 (1924) and pr. 2, 628—630 & 848—849. 1925; Marzell, Naturforsch. 3: 417—421. 1926; A. W. Hill, Ind. Kew. Suppl. 6: 219. 1926; McCallan, Flow. Gard. Calend. 18. 1927; Savelli, Nuov. Giorn. Bot. Ital., new ser., 34: 396—402, fig. 1—7. 1927; Grieve & Leyel, Modern Herb., pr. 1, 2: 830—832. 1931; T. H. Everett, Gard. Chron. Amer. 35: 179. 1931; Watt & Breyer-Brandwijk, Medic. & Poison. Pl. S. Afr., ed. 1, 153, 241, & 260. 1932; P'ei, Sinensia 2: [65]. 1932; H. C. Comber, Gard. Chron., ser. 3, 92: 371—373 & 391, fig. 185 & 194. 1932; H. F. Comber, Gard. Chron., ser. 3, 92: 412—413. 1932; Tu, Chinese Bot. Dict., abrdg. ed., 718, 851, & 852. 1933; I. N. Anderson, Nat. Hort. Mag. 12: 72—74. 1933; Anon., Ind. Sem. Ofr. Canje Jard. Bot. Montev. 8. 1935;

Reichert & Hoffmann, Arch. Pharm. & Ber. Deut. Pharm. Ges. 273: 357—360. 1935; Souèges, Compt. Rend. Acad. Sci. Paris 201: 234—236 & 529—531. 1935; Perry, Rhodora 38: 271—272. 1936; Reichert & Hoffmann, Arch. Pharm. & Ber. Deut. Pharm. Ges. 275: 474—477. 1937; Sampaio, Bol. Mus. Nac. Rio Jan. 13: 242 & 292. 1937; Rendle, Notes Fl. Bermuda 9 & 16. 1937; Cheymol, Journ. Pharm. & Chim., ser. 8, 25: 110—117 & 1020. 1937; Cheymol, Bull. Soc. Chim. Biol. 19: 1609 & 1626—1647. 1937; Emsweller & Blodgett, Proc. Amer. Soc. Hort. Sci. 35: 322—324. 1938; L. H. Bailey, Man. Cult. Pl., ed. 1, pr. 3, 628—630 & 848—849. 1938; E. S. & F. E. Clements, Natl. Geogr. Mag. 76: 240—241. 1939; V. Quinn, Stories & Legends Gard. Fls. 215—219. 1939; Kuwazima, Chem. Abstr. 1939: 7396. 1939; E. R. Spencer, Just Weeds 199—204, fig. 64 & 65. 1940; A. H. Holmgren, Handb. Vasc. Pl. Northeast. Nev. 152. 1942; L. H. Bailey, Man. Cult. Pl., ed. 1, pr. 4, 628—630 & 848—849. 1944; Zufall & Richtm., Chem. Abstr. 38: 4092. 1944; Schnack & Gonzalez, Rev. Argent. Agron. 12: 285—290, fig. 1—3, pl. 15. 1945; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 2, 1: 249, 306, 877, & 1032 (1946) and 2: 29, 895, 1161, 1178—1180, & 1243. 1946; Karrer & Solomon, Helv. Chim. Acta 29: 1544. 1946; Karrer & Solomon, Chem. Abstr. 1947: 1643. 1947; Selling, Bishop Mus. Spec. Publ. 38: 274 & 410. 1947; E. H. Walker, Contrib. U. S. Nat. Herb. 30: 402. 1947; A. H. Holmgren, Handb. Vasc. Pl. North. Wasatch 145. 1948; Hara, Enum. Sperm. Jap. 1: 190. 1948; Walker & Rodin, Contrib. U. S. Nat. Herb. 30: 465. 1949; L. H. Bailey, Man. Cult. Pl., ed. 2, 839—841 & 1113, fig. 175a. 1949; Chatterjee & Parks, Am. Soc. 71: 2249. 1949; Faegri & Iversen, Text-book Mod. Pollen Analys. 193 & 228. 1950; Russell, Ledingham, & Coupland in Fraser & Russell, Annot. List Pl. Saskat. 36. 1953; Nylander, MacM. Wild Flow. Book 33, 93, [331], 337, 340, & 480, pl. 166. 1954; Tarr, Fungi & Pl. Diseases Sudan 24 & 126. 1955; H. L. Mason, Pl. Marshes Calif. 677 & 679. 1957; Karrer, Konstit. & Vork. Organ. Pflanzenst. 55, 57, 124, 152, 173, 279, 289, 453, 454, 684, 777, & 824. 1958; H. St. John, Nomencl. Pl. 70. 1958; Anon., U. S. Dept. Agr. Bot. Subj. Index 15: 14348, 14349, 14360, & 14362. 1958; R. M. Carleton, Ind. Common Names Herb. Pl. 15, 17, 31, 42, 61, 62, 69, 81, 92, 96, 100, 105, 107, 116, 120, & 125. 1959; Grieve & Leyel, Modern Herb., pr. 2, 2: 830—832. 1959; Turrill, Rot. Bot. Gard. Kew Appendix 2: 16. 1959; Ary, Gregory, & Nicholson, Oxford Book Wild Fls. 136 & 137. 1960; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 3, 1: 249, 306, 877, & 1032 (1960) and 2: 29, 995, 1161, 1178—1180, & 1243. 1960; Munz, Calif. Spring Wild Fls. 60, fig. 105. 1961; Martin & Bradley, Seed Ident. Man. 37 & 194, fig. 234—236 & 260. 1961; Munz, Calif. Desert Wildfls. 47, pl. 62. 1962; Watt & Breyer-Brandwijk, Medic. & Poison. Pl. S. Afr., ed. 2, 1054, 1355, & 1453. 1962; H. F. MacMillan, Trop. Plant. & Gard., ed. 5, 129, 192, & 434. 1962; Prain, Bengal Pl., ed. 2, 1: 65 (1963) and 2: 616 & 617. 1963; Maheshwari, Pl. Delhi 278. 1963; Srinivasan & Agarwal, Bull. Bot. Surv. India 5: 80. 1963; Stearn, System. Assoc. Publ. 6: 84. 1964; Batson, Wild Fls. S. C. 99. 1964; Sharp & Baker, Castanea 29: 183. 1964; Marie-Victorin, Fl. Laurent., ed. 2, 489 & 490. 1964; E. E. Lord, Shrubs

& Trees Austral. Gard., rev. ed., 314. 1964; J. E. Moore, Castanea 30: 26. 1965; Pitschman, Reislgl. & Schiechtl, Fl. Sudalp. 189. 1965; Schubert, Assoc. Trop. Biol. Bull. 4: 88. 1965; S. A. Manning, Syst. Guide Flow. Pl. 18 & 141. 1965; Readett, Hawkes, & Cadbury, Proc. Birmingh. Nat. Hist. Soc. 20 (4): 43. 1965; Mohlenbrock & Voigt, Trans. Ill. Acad. Sci. 58 (4): 295. 1965; Teague, Anal. Mus. Hist. Nat. Montev., ser. 2, 7 (4): 44--45. 1965; Ohwi, Fl. Jap. 763. 1965; Datta, Handb. Syst. Bot. 181, 182, 338, & 434. 1965; Troncoso, Biol. Abstr. 46: 7724. 1965; Vyas, Journ. Indian Bot. Soc. 44: 152 & 161. 1965; Chopra, Badhwar, & Ghosh, Poison. Pl. India 2: 694, 695, & 700--701, fig. 179. 1965; Banerji, Rec. Bot. Surv. India 19: 75. 1965; J. A. Clark, Gray Herb. Card Ind. issue 245. 1965; Maguire, Assoc. Trop. Biol. Bull. 4: 43. 1965; Hartley, Univ. Iowa Stud. Nat. Hist. 21: 144 & 162. 1966; Wunderlin, Trans. Ill. Acad. Sci. 59 (2): 143. 1966; Gaiser & Moore, Surv. Vasc. Pl. Lambton Co. 100--101. 1966; Pelt, Nat. Monspel. Bot. 17: 180. 1966; Polunin & Huxley, Fls. Medit. 154. 1966; Mishra, Sci. Cult. 32: 199--200. 1966; C. A. Sm., Common Names S. Afr. Pl. 129 & 601. 1966; Holmgren & Reveal, U. S. Forest Serv. Res. Paper INT-32: [Checklist Vasc. Pl. Intermont. Reg.] 91. 1966; Erdtman, Pollen Morph. & Pl. Tax. 449, fig. 256a. 1966; Silberhorn, Castanea 31: 293. 1966; Reese & Thieret, Castanea 31: 274. 1966; Mohlenbrock, Windler, & O'Dell, Castanea 31: 300. 1966; H. L. Hoffman, Castanea 31: 309. 1966; G. B. Foster, Herbs for Every Gard. 199. 1966; Berrall, Gard. Illustr. Hist. 44, 279, & 326. 1966; Kaul & Zutshi, Journ. Indian Bot. Soc. 45: 358 & 360. 1966; Szafer, Veg. Poland 298. 1966; Queen, Madman Theory 134. 1966; A. Maria, Pl. Valle Cochabamb. 2: 42. 1966; Shinn, Sida 2: 442 & 448. 1966; J. G. Barton in Novak, Pict. Encycl. Pl. & Fls. 403, fig. 801. 1966; Solbrig, Biol. Abstr. 47: 2870. 1966; Sorin, Jard. France [Bull. Soc. Nat. Hort. France] 1966: 105--107. 1966; Schwanita, Orig. Cult. Pl. 92. 1966; Hocking, Excerpt. Bot. A.10: 270. 1966; Jiménez, Supl. Cat. Fl. Doming. 1: 220--221. 1966; Meyer & Weyrauch, Guia Excurs. Biol. Tucum. 32, 64, & 123. 1966; Prodan & Buia, Fl. Mic. Ilus. Roman. 401 & 403, fig. 369. 1966; R. H. Compton, Journ. S. Afr. Bot. Suppl. 6: 65 & 157. 1966; Behm, Fl. Um Uns 50, 51, & 287. 1966; Pop, Bot. Gard. Cluj 12. 1966; Boivin, Naturaliste Can. 93: 428--429 & 437. 1966; C. Weber, Boisiera 12: 167. 1966; G. L. Davis, Syst. Embryol. Angiosp. 271. 1966; Airy-Shaw in Willis, Dict. Flow. Pl., ed. 7, 135, 167, & 1176--1178. 1966; Moldenke, Biol. Abstr. 47: 6794 & 8471. 1966; M. Raymond, Ann. Résult. Jard. d'Essai Jard. Bot. Montreal 1965: 85 (1966) and 1966: 61 & 70. 1967; Hedge, Notes Roy. Bot. Gard. Edinb. 28: 81. 1967; Van Steenis-Kruseman, Fl. Males. Bull. 4: lxviii & 1069. 1967; Rickett, Gard. Journ. 17: 38. 1967; Wayside Gardens [Cat.] 1967: 214 & 224. 1967; Shinn, Univ. Kans. Sci. Bull. 46: 757, 790, 804, 876, 881, 886, 887, 891, & 928. 1967; Hocking, Excerpt. Bot. A.11: 102--103. 1967; Moldenke, Phytologia 14: 275--301, 338, 344--346, 349, 350, & 394--396. 1967; Schling, Seedsman Cat. Spring 1967 Anniv. Ed. 20. 1967; Cody, Ind. Sem. 1967: 18. 1967; Braun-Blanquet, Acta Geobot. 14 (3): 10, 11, & 112. 1967; Anon., Country Shopper 7 (7): 14. 1967; Anon., Biol. Abstr. 48: 4106 (1967),

48 (9): S.18 (1967), and 48 (17): S.182. 1967; Moldenke, Résumé Suppl. 15: 1—8, 11, 15, & 24. 1967; J. F. Williamson, Sunset West. Gard. Book, new ed., 437. 1967; Anon., Rutgers Univ. Dept. Hort. & Forest. Veget.-Flow. Open House F.4. 1967; C. L. Porter, Tax. Flow. Pl., ed. 2, 394 & 395, fig. 347 & 348. 1967; Davidson & Buell, Am. Midl. Nat. 77: 381. 1967; Anon., Assoc. Etud. Tax. Fl. Afr. Trop. Index 1966: 56. 1967; M. S. Mill., Plainfield Courier News 24, September 6. 1967; Dony, Fl. Hertfordsh. 89, map 37a. 1967; Zukowski, Fl. Polska 11: [63]—65. 1967.

The genus Aubletia Neck., previously listed by me as a synonym of Verbena, appears, rather, to belong in the synonymy of Ruellia L. in the Acanthaceae. Necker, in his Elem. Bot. 1: 356—357 (1790), describes it as follows: "AUBLETIA* Aublétie*. 557. Char. Diagn. Perigynanda utraque, 2-labiata. Capsula, 2-locularis; valvis elasticis. Char. Pec. Fructific. monogamica. Perigynanda propria, 2-plex: utraque, 2-labiata, 1-sepala. Labium superius, perigynandae exterioris, simplex, latius. Inferius, 3-fidum. Perigynanda interior, ringens, staminifera. Labium superius, erectum. Inferius, 3-fidum. Stamina, didynamica. Pistillum, 1. Stylus, simplex. Stigma, integrum. Capsula, 2-locularis, 2-valvis. Valvulae, ungue elastico instructae, plurispermae. Proles in hac specie, caulescentes. Folia simplicia. Quaed. Ruell. Linn. Obs. In ambobus generibus chasmatophytum nempe & plasyrgophytum, aubletia, ruellia, soubeyrania, crantzia & senkebergia, limites statuuntur."

The Aubletia of Gaertner is a synonym of Sonneratia in the Sonneratiaceae, that of Loureiro is a synonym of Paliurus Mill. in the Rhamnaceae, that of Richard is a synonym of Monnieria L. in the Rutaceae, and that of Schreber is a synonym of Apeiba Aubl. in the Tiliaceae. The Billardiera of Smith is a valid genus in the Pittosporaceae, while that of Vahl is a synonym of Coussarea Aubl. in the Rubiaceae.

Shinn (1967) reports that he observed the bee, Calliopsis (Verbenapis) andrediformis, males, visiting the flowers of Verbena at Lawrence, Kansas, and at Nacogdoches, Texas, but no females doing this at either locality, and that the bee, C. hondurasica, is an oligolege for Verbena as well as for Lippia and Phyla. He says that the genus Calliopsis as a whole favored legumes as first choice, with Verbenaceae and compositae as second choice.

It should be noted here that L., Syst. Nat., ed. 10, 2: 852 (1859) is dated "1860" by B. L. Robinson in Proc. Am. Acad. 38: 196 (1902), and H.B.K., Nov. Gen. & Sp. Pl., ed. quart., 2: 274 (1818) is dated "1817" by him. The reference dates of H.B.K.'s works cited in the bibliography above by me have been authenticated by Barnhart (1902).

There is considerable confusion concerning the dates of publication of the N. J. Andersson papers cited in the bibliography of this genus and elsewhere. According to Robinson (1902) the one in Vet. Akad. Handl. Stockh. 1853: 199—200 was issued in 1854, while

the separately paged publication with the same title, Om Galap. Veg., was dated "1857" but cites another publication issued in 1859 and therefore could not have been issued before 1859 itself!

According to the U. S. Dept. Agr. Bot. Subj. Index 15: 14360 (1958) the "Schnack, Inst. Fitotec. Santa Catalina 4: 17--22. 1942" reference was not actually published until 1944. The Boissier (1879) reference is sometimes cited as "1875", but only pages 1--280 were issued in that year; pages 281--1276 did not appear in print until the year 1879.

Teague (1965) lists "a spontaneous hybrid", unnamed, as his no. T.169 from Paraguay. Karrer (1958) and Pelt (1966) report that the chemical substance, "verbenalin", is found in species of Cornus as well as in Verbena.

Additions to the list of species or names excluded from the genus are

Verbena americana media annua, ocymi folio lanuginoso, flore purpureo amplo Breyne = Bouchea prismatica (L.) Kuntze

Verbena fluminensis (Vell.) Moldenke = Bouchea fluminensis (Vell.) Moldenke

Verbena lappulaceae Grieve & Leyel = Priva lappulaceae (L.) Pers.

Verbena scutellariae, s. cassidae folio, dispermos, americana, an
Verbena indica Bontii. Hist. Ind. Or. forte etiam Verbena
curassavica scutellariae foliis, flore purpurascente Pluk. =
Bouchea prismatica (L.) Kuntze

Verbena tricolor Raymond = Viola tricolor L., Violaceae

Verbena xeriphioides Gill. & Hook. = Junellia seriphioides (Gill. & Hook.) Moldenke

Airy-Shaw (1966) suggests that xVeronicena Moldenke may belong in the synonymy of Verbena although it was actually proposed as an intergeneric interfamily hybrid. He also places Burseria Loefl. in the synonymy of Verbena, while actually it belongs to that of Priva Adans. He notes a Verbena Rumph. as a synonym of Aerva Forsk. in the Amaranthaceae. Spencer (1940) claims that the generic name, Verbena, comes originally from the Latin word "verber", meaning "a rod, stick, or stem". The Polish common name for the genus, according to Zukowski (1967), is "werbena".

Munz (1962) tells us that "Most of our California verbenas are introduced weeds." It is of interest to note that non-taxonomic botanists are repeatedly referring to a genus Canadea, as, for instance, most recently, Davis (1966). This name seems to have started with Paternmann in 1935 and then coined by succeeding cytologists.

Karrer (1958) speaks of a "verbena oil" which contains also what he calls "isovaleriansäure", "2-methyl-hepten-(2)-on-(6)", "a-terpineol", and "citral". He speaks also of a "verbenalol", $C_{11}H_{14}O_5$, and "verbenalin", $C_{17}H_{24}O_{10}$, and reports that geraniol, $C_{10}H_{18}O$, nerol, $C_{10}H_{18}O$, and nerolidol, $C_{15}H_{26}O$, have been isolated from verbena oil. This oil, however, is derived from Aloysia

triphylla (L'Hér.) Britton, known as the "verbena oil-plant" to some botanists.

Perhaps it should also be noted here that the name, "shrubby verbena", is often applied to members of the genus Lantana, while the "sand-verbena" of our western states are members of the nyctaginaceous genus Abronia.

Martin & Bradley (1961) describe the seeds of Verbena as "compressed-oblong and slightly rounded-triangular in cross section, making it somewhat 2-sided, the rounded back bearing lengthwise ridges toward [the] lower end and a network of cross ridges below; inner face of 2 planes meeting in a long ridge, the surface generally covered with whitish papillae; margin bordered by a narrow flange; attachment scar whitish (in V. ciliata the scar is surrounded by a cuplike extension); 1.5—3 mm. long; endosperm lacking."

Tarr (1955) reports a species of the genus (probably V. officinalis L. or V. supina L.) is often infested by the fungus, Leveillula taurica.

VERBENA ABRAMSI Moldenke

Additional bibliography: Moldenke, Phytologia 13: 244. 1966; Moldenke, Biol. Abstr. 47: 8471. 1966; Hocking, Excerpt. Bot. A. 11: 102. 1967.

Additional citations: CALIFORNIA: Lake Co.: R. F. Hoover 3812, in part (Du—329221).

xVERBENA ADULTERINA Hausskn.

Additional & emended synonymy: Vitex adulterina Hausskn. ex A. W. Hill, Ind. Kew. Suppl. 6: 219, sphalm. 1926. xVitex adulterina Hausskn. ex Moldenke, Résumé Suppl. 15: 24, sphalm. 1967.

Additional & emended bibliography: A. W. Hill, Ind. Kew. Suppl. 6: 219. 1926; Moldenke, Phytologia 13: 181. 1966; Moldenke, Résumé Suppl. 15: 24. 1967.

VERBENA ALATA Sweet

Additional bibliography: Moldenke, Phytologia 14: 277. 1967.

Additional citations: BRAZIL: Rio Grande do Sul: Rambo 44819 (B), 45639 (B), 54735 (B); Sehnem 7946 (B).

VERBENA AMBROSIFOLIA Rydb.

Additional synonymy: Verbena ambrosiaefolia Rydb. ex Moldenke, Résumé Suppl. 15: 24, in syn. 1967.

Additional bibliography: Moldenke, Phytologia 14: 277. 1967; Moldenke, Résumé Suppl. 15: 2 & 24. 1967.

My son, Andrew R. Moldenke, informs me that his no. 1874, cited below, had uniformly red corollas and is typical of hundreds of plants over many miles of roadside. He says that this taxon is very distinct in the field from the one with the blue corollas represented by his numbers 1848, 1872, and 1875, herein cited as f. eglandulosa Perry.

The Kraus s.n. [June 22, 1926], distributed as V. ambrosifolia, is actually V. wrightii A. Gray, while Breedlove 1492 is something non-verbenaceous.

Additional citations: COLORADO: Pueblo Co.: A. Brown 19 (Ms—30750); Grether, Gilbert, & Gale s.n. [17 June 1951] (Ws). Weld Co.: Osterhoit s.n. [July 8, 1909; Herb. Field Mus. 36824] (Ws). NEW MEXICO: Dona Ana Co.: Wooton 642 (Ms—30836). Lincoln Co.: Wooton 363 (Ms—30757, Ms—30759). Santa Fe Co.: H. R. Bennett 8239 (S). ARIZONA: Santa Cruz Co.: A. R. Moldenke 1874 (Rf). MEXICO: Chihuahua: H. S. Gentry 7998 (Du—335265). Coahuila: Edw. Palmer 1050 (Ms—30831). Sonora: H. S. Gentry 7971 (Du—335277).

VERBENA AMBROSIFOLIA f. EGLANDULOSA Perry

Additional bibliography: Moldenke, Phytologia 13: 244. 1966; Moldenke, Résumé Suppl. 15: 2. 1967.

My son, Andrew R. Moldenke, informs me that the corollas on his numbers 1848, 1872, and 1875, cited below, were uniformly blue and that the taxon which these collections represent is very distinct in the field from that represented by his no. 1874, herein cited as typical V. ambrosifolia Rydb. On Moldenke & Moldenke 2095 the corollas were "lavender".

Additional citations: ARIZONA: Cochise Co.: A. R. Moldenke 1848 (Ac). Pima Co.: Kearney & Peebles 10548 (Du—350446). Santa Cruz Co.: A. R. Moldenke 1872 (Ac), 1875 (Rf). MEXICO: Chihuahua: Moldenke & Moldenke 2095 (Rf).

VERBENA ARAUCANA R. A. Phil.

Additional bibliography: H. F. Comber, Gard. Chron., ser. 3, 92: 413. 1932; Moldenke, Phytologia 13: 182. 1966.

VERBENA ARISTIGERA S. Moore

Additional bibliography: Moldenke, Phytologia 13: 182. 1966. Teague found this species in flower in September.

Additional citations: PARAGUAY: Teague 289 (Ws). ARGENTINA: Formosa: Morel 1127 (Ms—34252).

VERBENA BALANSAE Briq.

Additional bibliography: Moldenke, Phytologia 13: 183. 1966.

Woolston describes this plant as an herb, 30—35 cm. tall, with decumbent or prostrate stems, and pale-blue flowers, the tube dark violet-blue, growing in "loma in tierra colorada".

Additional citations: PARAGUAY: Jørgensen 4582 (Du—203336); Woolston 722 (S).

VERBENA BANGIANA Moldenke

Additional bibliography: Moldenke, Lilloa 12: 155. 1946; Moldenke, Phytologia 10: 93. 1964.

The type collection was originally identified and distributed

to herbaria as V. bonariensis L., and was later cited by me (1946) as V. litoralis H.B.K.

Additional citations: BOLIVIA: La Paz: H. H. Rusby 911 (Ws--isotype).

VERBENA BERTERII (Meisn.) Schau.

Emended synonymy: Verbena erinoides L. ex Lorentz & Niederlein, Bot. Exped. Rio Negro 266, sphalm. 1881.

Additional bibliography: Hieron., Bol. Acad. Nac. Cienc. Córdoba 4: 407. 1881; Lorentz & Niederlein, Bot. Exped. Rio Negro 266. 1881; Moldenke, Phytologia 14: 277 & 287. 1967.

Additional citations: CHILE: Aconcagua: Zöllner 1488 (Rf). Antofagasta: Zöllner 1239 (Rf). Valparaíso: Zöllner 1240 (Ac).

VERBENA BIPINNATIFIDA Nutt.

Additional synonymy: Verbena bipinnatifida Nutt. ex Moldenke, Résumé Suppl. 15: 24, in syn. 1967. Verbena biplinatifida Nutt., in herb.

Additional bibliography: A. Gray, Syn. Fl. N. Am., ed. 1, 2 (1): 337 (1878) and ed. 2, 2 (1): 337. 1886; E. S. & F. E. Clements, Natl. Geogr. Mag. 76: 240--241. 1939; L. H. Bailey, Man. Cult. Pl., ed. 2, 839, 840, & 1113, fig. 175a. 1949; Maheshwari, Fl. Delhi 278--279. 1963; Vyas, Journ. Indian Bot. Soc. 44: 161. 1965; Moldenke, Phytologia 14: 277. 1967; Shinn, Univ. Kans. Sci. Bull. 46: 881. 1967; Moldenke, Résumé Suppl. 15: 2, 3, & 24. 1967.

Additional illustrations: E. S. & F. E. Clements, Nat. Geogr. Mag. 76: 241 [in color]. 1939; L. H. Bailey, Man. Cult. Pl., ed. 2, fig. 175a. 1949.

Shinn (1967) records the bee, Calliopsis (Verbenapis) verbenae, as an oligolege on this species in New Mexico

Cory describes the plant as having its stem branched at the base, the branches spreading. Recent collectors have found it growing in alluvium, in Viola limestone, and in xeric pastures without crops. The Andrew Moldenkes describe the plant as a "common roadside weed", "common in alpine roadside clearings", and a "common groundcover on peak" in Cochise County, Arizona. Srinivasan & Agarwal (1963) tell us that the species is often cultivated in India, but without seeing the actual specimens, I doubt this very much.

The H. R. Bennett 8239, distributed as V. bipinnatifida, is actually V. ambrosifolia Rydb.; Kearney & Peebles 10548 is V. ambrosifolia f. eglandulosa Perry; McCart 8964 is V. ciliata var. longidentata Perry; I. L. Wiggins 13393 is V. ciliata var. pubera (Greene) Perry; Thornber s.n. [May 28, 1905] is V. gooddingii Briq.; and Porter & Porter 3978 is V. wrightii A. Gray.

The "Verbena bipinnatifida" recorded by various Indian authors, including Maheshwari (1963), is most certainly not this species. It is most probably V. tenuisecta Briq., which see.

My son, Andrew Ralph Moldenke, informs me that he and his wife observed a white-flowered form of this species (V. bipinnatifida)

growing among the normal form (represented by Moldenke & Moldenke 2052), but did not collect any material. This white-flowered form was observed by him along with the normal form in Rustler Park, Chiricahua Mountains National Forest, Cochise County, Arizona, on July 23, 1967. He says that it was apparently an annual, while the normal plant was a perennial. He gathered seeds of both forms and plans to grow them at Stanford University.

Additional citations: SOUTH DAKOTA: Haakon Co.: Mrs. H. R. English s.n. [August 18, 1927] (Ws). OKLAHOMA: Comanche Co.: Hopkins, Nelson, & Nelson 801 (Du--320915). Murray Co.: Demaree 12296 (Du--372078); Hopkins, Nelson, & Nelson 709 (Du--320947). TEXAS: Bee Co.: M. C. Johnston 541 (Ms--44073). Dallas Co.: Lundell & Lundell 11315 (Du--351437); J. Reverchon s.n. [Curtiss 1962*] (Ms--30755). Reagan Co.: Cory 53507 (Du--362510). Travis Co.: Nickerson s.n. [March 16, 1950] (Ms--34255); Mrs. Smith s.n. [Austin, 5/2/35] (Du--362691). Val Verde Co.: DeWolf 791 (Ms--34280). ARIZONA: Cochise Co.: Moldenke & Moldenke 2026 (Rf), 2051 (Ac), 2052 (Rf). Coconino Co.: D. T. MacDougal 317 (Ms--30830). Pima Co.: Pringle s.n. [April 13, 1881] (Ms--30758). Santa Cruz Co.: L. Benson 8821 (Du--329614). MEXICO: Nuevo León: R. Garcia 69 (Du--511958).

VERBENA BONARIENSIS L.

Additional & emended bibliography: H.B.K., Nov. Gen. & Sp. Pl., ed. folio, 2: 223 (1817) and ed. quart., 2: 276. 1818; Hieron., Bol. Acad. Nac. Cienc. Córdoba 4: [Sert. Sanjuan.] 68. 1881; A. S. Hitchc., Ann. Rep. Mo. Bot. Gard. 4: 117. 1893; Barnhart, Bull. Torrey Bot. Club 29: 590. 1902; Gamble, Fl. Presid. Madras 6: 1106. 1924; Anon., Ind. Sem. Ofr. Canje Jard. Bot. Montreal 8. 1935; Rendle, Notes Fl. Bermuda 16. 1937; Selling, Bishop Mus. Spec. Publ. 38: 274 & 410. 1947; L. H. Bailey, Man. Cult. Pl., ed. 2, 840 & 1113. 1949; H. L. Mason, Fl. Marshes Calif. 676. 1957; Anon., U. S. Dept. Agr. Bot. Subj. Index 15: 14360. 1958; Watt & Breyer-Brandwijk, Med. & Poison. Pl. S. Afr., ed. 2, 1054 & 1453. 1962; H. F. MacMillan, Trop. Plant. & Gard., ed. 5, 192. 1962; Liogier, Bull. Torrey Bot. Club 92: 301. 1965; Ohwi, Fl. Jap. 763. 1965; Teague, Anal. Mus. Hist. Montevid., ser. 2, 7 (4): 45. 1965; C. A. Sm., Common Names S. Afr. Pl. 129 & 601. 1966; R. H. Compton, S. Afr. Bot. Suppl. 6: 157. 1966; Reese & Thieret, Castanea 31: 274. 1966; Moldenke, Résumé Suppl. 15: 1, 2, 11, & 15. 1967; Moldenke, Phytologia 14: 278. 1967.

The flowers are described as "blue" on Venturi 2814, and as "purple" on M. S. Clements, while on Ewan 19175 they are said to have had the "petal lobes rich-violet" and the throat "magenta when fresh". Reese & Thieret (1966) record the species from the Five Islands of Louisiana. Smith (1966) records the vernacular name, "blouwaterbossie", from South Africa, and comments that it has been known at the Cape of Good Hope since Thunberg's time, was certainly introduced long before that, and is now widespread there except in the arid areas.

It should be noted here that the H.B.K. reference dates given above have been authenticated by Barnhart (1902).

Teague (1965) refers to this species as a "very common ruderal weed", known as "caá mará ruguay", and cites his no. T.197 with "grayish-blue" corollas, from Paraguay. Ohwi (1965) says that it is "Sometimes cultivated and naturalized in the western part of Honshu and Kyushu", Japan. Compton (1966) records it from Swaziland.

Material has been misidentified and distributed in herbaria under the name V. patagonica Speg. On the other hand, the J. Reverchon s.n. [Curtiss 1963**], distributed as V. bonariensis, is actually V. pumila Rydb. in some [not all] herbaria, being a mixture. The T. J. Jenkins s.n. [Herb. Transvaal Mus. 10275], cited previously by me as being deposited in my personal herbarium, is now in that of the Texas Research Foundation at Renner, Texas.

Additional citations: SOUTH CAROLINA: Charleston Co.: Curtiss 1963**, in part (Ms—30761). GEORGIA: Ware Co.: Kuns 208 (Ws). LOUISIANA: Ouachita Par.: Ewan 19175 (Rf). Washington Par.: Demaree 50721 (Ac). CALIFORNIA: Marin Co.: J. T. Howell 19323 (Du—311529). BRAZIL: Rio Grande do Sul: Rambo, Herb. Anchieta 44251 (B), 49696 (B), 57305 (B). URUGUAY: Herter 268 [Herb. Herter 81709] (Ws). ARGENTINA: Buenos Aires: Venturi 54 [Herb. Inst. Miguel Lillo 31447] (Du—317597). Formosa: Morel 372 (Ms—34259). Tucumán: Venturi 2814 (Du—372502). PORTUGUESE EAST AFRICA: Lourenço Marques: Torre 2239 (Z). MELANESIA: NEW GUINEA: North-eastern New Guinea: M. S. Clemens 41317 (Mi). CULTIVATED: Germany: Wagenitz s.n. [Mus. Bot. Berol. Gartenherb. W.381] (Rf).

VERBENA BONARIENSIS var. CONGLOMERATA Briq.

Additional bibliography: Moldenke, *Phytologia* 13: 185. 1966.

The Rambo, Herb. Anchieta 44251 & 49696, distributed as this variety, are actually typical V. bonariensis L.

Additional citations: MASSACHUSETTS: Hampshire Co.: C. B. Grover s.n. [June 28, 1951] (Ms—34258).

VERBENA BRACTEATA Lag. & Rodr.

Additional synonymy: Verbena bracteosa Lag. & Rodr. ex Moldenke, *Résumé Suppl.* 15: 24, in syn. 1967. Verbena bracteata Lag. & Rodr. ex Moldenke, *Résumé Suppl.* 15: 24, in syn. 1967.

Additional & amended bibliography: A. Gray, *Syn. Fl. N. Am.*, ed. 1, 2 (1): 336. 1878; J. Macoun, *Cat. Can. Pl.* 1: 379. 1884; A. Gray, *Syn. Fl. N. Am.*, ed. 2, 2 (1): 336. 1886; H. Fischer, *Beitr. Vergl. Morphol. Pollenk.* 46—47. 1890; P. B. Kennedy, *Annot. List Wild Fls. Calif.* 112. 1917; A. H. Holmgren, *Handb. Vasc. Pl. North-east. Nev.* 152. 1942; A. H. Holmgren, *Handb. Vasc. Pl. North. Watsatch* 145. 1948; Russell, *Ledingham, & Coupland in Fraser & Russell, Annot. List Pl. Saskat.* 36. 1953; H. L. Mason, *Fl. Marshes Calif.* 677. 1957; Martin & Bradley, *Seed Ident. Man.* 37, fig. 234. 1961; Sharp & Baker, *Castanea* 29: 183. 1964; Mohlenbrock & Voigt, *Trans. Ill. Acad. Sci.* 58 (4): 295. 1965; Holmgren & Reveal, *U. S.*

Forest Serv. Res. Paper INT.32: [Checklist Vasc. Pl. Intermont. Reg.] 91. 1966; Mohlenbrock, Windler, & O'dell, Castanea 31: 300. 1966; Hartley, Univ. Iowa Stud. Nat. Hist. 21: 114. 1966; Boivin, Naturaliste Can. 93: 429. 1966; Wunderlin, Trans. Ill. Acad. Sci. 59 (2): 143. 1966; Gaiser & Moore, Surv. Vasc. Pl. Lambton Co. 100. 1966; Cody, Ind. Sem. 1967: 18. 1967; Shinn, Univ. Kans. Sci. Bull. 46: 790, 886, & 928. 1967; Moldenke, Phytologia 14: 278. 1967; Moldenke, Résumé Suppl. 15: 2 & 24. 1967.

Additional illustrations: Martin & Bradloy, Seed Ident. Man. fig. 234. 1961.

Sharp & Baker (1964) comment that this species seems in Tennessee to be limited to the western tier of counties. Mohlenbrock, Windler, & O'Dell (1966) cite Windler & O'Dell 478 in the herbarium of Southern Illinois University. Shinn (1967) records the bee, Calliopsis andreniformis, visiting the flowers of this species, but only the females.

Recent collectors have found Verbena bracteata growing on the margins of reservoirs, on soil flooded when the reservoir is full, with Xanthium, Distichlis, etc.; with Cressa, Sida, and Frankenia on dry mud flats; below the highwater line of a river; in loose black soil; in dry sandy soil; in fine sandy loam of the Woodbine group, Lewisville formation; on moist barren soil in pinyon-juniper-yellow pine association; in open sagebrush country; on graded roadsides in pine forests; on dry gravelly streambanks; in open grassland on foothills; in dry open ground; forming a large spreading clump from a single caudex on a sand bar along a river; along the edge of a run-off; on wasteland roadsides; and associated with Lactuca, Evax, Buchloë, and Salsola in level grassland. The Jespersen describe it as a "sprawling hispid herb to 18 inches high, with small flowers". Raven describes it as forming prostrate mats. Kennedy (1917) records it as growing in alkaline soil. Holmgren & Reveal (1966) record the common name "bigbracht verbena".

Bennett describes it as having a thick perennial root with many stems, semi-decumbent at the base, in rosettes, ascending-erect except at the base, in dry ground. Of his August 2 collection he says "Evidently a hybrid with V. stricta Vent. or some other species", but I see no evidence of such hybridity exhibited by his specimen. The flowers were "bluish-purple" on Jespersen & Jespersen 2708, but "pink with white center" on Alexander & Kellogg 1739; "blue" on S. S. White 1346 and "purplish-lavender" on I. L. Wiggins 14976. White refers to the plant as a "creeping herb in pastures", Demaree found it growing on dry level ridges, and Wiggins encountered it along watercourses where water seeps in the spring. Hartley (1966) states that it is found along roadsides, railroads and weedy yards, "scattered throughout the Driftless Area, frequent." Mohlenbrock & Voigt (1965) cite Voigt 1870 from Illinois.

Suksdorf s.n. [July 22, 1881] is a mixture with a species of Populus (fruit). Material of V. bracteata has been misidentified

and distributed in herbaria under the name V. canescens Kunth.

Additional citations: NEW YORK: Queens Co.: A. Brown s.n. [Hunter's Point, Aug. 2, 1879] (Ms—78113). PENNSYLVANIA: Lancaster Co.: A. A. Heller s.n. [August 29, 1900] (Ms—30766). GEORGIA: Floyd Co.: Ravenel s.n. [Rome, 1868] (Ms—30777). ILLINOIS: Campaign Co.: H. S. Reynolds s.n. [May 29] (Ms—30773). Henderson Co.: H. N. Patterson s.n. [Oquawka, September 1874] (Ms—30765). La Salle Co.: Boltwood s.n. [Ottawa, 1881] (Ms—34266). INDIANA: Lake Co.: E. Robinson s.n. [Gary, Sept. 11, 1935] (Du—358079). KENTUCKY: Fayette Co.: R. Peter s.n. [Sept. 1835] (Ms—30769). MICHIGAN: Cheboygan Co.: Ehlers 3284 (Du—361097). SOUTH DAKOTA: Butte Co.: F. L. Bennett 618 (Du—347240). Jones Co.: I. L. Wiggins 14976 (Mi). MISSOURI: Jackson Co.: A. Brown s.n. [Kansas City, July 17, '78] (Ms—30770). Saint Louis: Mühlenbeck 2660 (Ac), 2707 (Rf). ARKANSAS: Hop Spring Co.: Demaree 19335 (Ms—50393). Prairie Co.: Demaree 37763 (Rf). Saint Francis Co.: Demaree 11415 (Du—361595). MONTANA: Rosebud Co.: H. R. Bennett s.n. [7-25-57] (Du—420704), s.n. [August 2, 1957] (Du—420763). Sweetgrass Co.: Hitchcock & Muhlick 13305 (Du—316183). IDAHO: Idaho Co.: Q. Jones 366 (Du—353526). WYOMING: Platte Co.: C. L. Porter 3987 (Du—328891). UTAH: Salt Lake Co.: R. K. Vickery 2374 (Du—449408). NEVADA: Clark Co.: Alexander & Kellogg 1739 (Du—307475). Nye Co.: Raven 19680 (Du—504362). COLORADO: Boulder Co.: Ewan, Pl. Exsicc. Gray. 1090 (Ms—83654). OKLAHOMA: Oklahoma Co.: S. S. White 1346 (Mi). TEXAS: Denton Co.: McCart 8976 (Du—511973). Lubbock Co.: Demaree 7562 (Ws). Moore Co.: Jespersen & Jespersen 2708 (Du—335915). NEW MEXICO: Dona Ana Co.: Wooton 409 (Ms—30767). Grant Co.: O. B. Metcalfe 137 (Ms—30764). ARIZONA: Apache Co.: Demaree 38466a (Ac), 42667 (Rf). Coconino Co.: L. D. Benson 9649 (Du—326796); A. A. Heller 15783 (Du—312034); MacDougal 286 (Ms—30768). Gila Co.: F. W. Gould 3918 (Du—348141). Graham Co.: Thornber s.n. [Thatcher, 8/24/05] (Du—327062). Mohave Co.: Parker, McClintock, & Robbins 6278 (Du—348125). Yavapai Co.: H. H. Rusby s.n. [June 1883] (Ms—30774). WASHINGTON: Grant Co.: H. W. Smith 724 (Du—318727). Klickitat Co.: Suksdorf s.n. [July 22, 1881] (Ms—30813). CALIFORNIA: Lassen Co.: Wiggins & Wiggins 16338 (Du—450455). Merced Co.: Nobs & Smith 165 (Du—415617). County undetermined: Edw. Palmer 341E (Ms—30763), 342E (Ms—30771). MEXICO: Coahuila: Edw. Palmer 1048 (Ms—30772).

VERBENA BRASILIENSIS Vell.

Additional bibliography: Shinners, Sida 2: 393 & 448. 1966; H. L. Hoffman, Castanea 31: 309. 1966; Moldenke, Phytologia 14: 279 & 288. 1967; Moldenke, Résumé Suppl. 15: 2, 5, & 24. 1967.

Carter found this species growing in a ditch with Lotus ameri-

camus, Rumex crispus, Melilotus alba, Helianthus annuus, and Cuscuta sp. Demaree encountered it in Arkansas on low ridges of chalk and reports it "common" on marl and gypsum ridges. Material has been misidentified in gardens and distributed in herbaria as V. simplex Lehm.

Additional citations: ALABAMA: Baldwin Co.: Iltis & al. 25207 (Ws). ARKANSAS: Little River Co.: Demaree 54085 (Ac). Sevier Co.: Demaree 54000 (Rf), 54290 (Ac). LOUISIANA: Ouachita Par.: E. D. Barkley 37420 (Rf). Plaquemines Par.: Demaree 50745 (Ac). Saint Tammany Par.: Demaree 30759 (Rf). Washington Par.: Demaree 50723 (Rf). TEXAS: Hardin Co.: Tharp 50-108 (Ms--34271). CALIFORNIA: Fresno Co.: E. Carter 91 (Du--343877). BOLIVIA: Cochabamba: R. F. Steinbach 699 (S). PARAGUAY: Morong 128 (Ws). ARGENTINA: San Juan: Cuezzo 2210 (Ms--34272). Tucumán: O'Donell 95 [Herb. Inst. Miguel Lillo 36218] (Du--317604). CULTIVATED: Germany: Wagenitz s.n. [Mus. Bot. Berol. Gartenherb. W.380] (Rf).

VERBENA BRASILIENSIS var. SUBGLABRATA Moldenke

Additional bibliography: Moldenke, Phytologia 8: 414--415. 1962; Moldenke, Résumé Suppl. 15: 5. 1967.

Additional citations: CHILE: Santiago: Gersh 70 (Ws).

VERBENA CABRERAE Moldenke

Additional bibliography: Moldenke, Phytologia 13: 186. 1966.

Steinbach describes this plant as abundant along roadsides in partly sandy and wet soil, at 550 meters altitude, flowering in June, with the flowers "violeta fuerte, caliz verde con jaspe purpurino".

Additional citations: BOLIVIA: Santa Cruz: R. F. Steinbach 321 (S). ARGENTINA: Santiago del Estero: Huidobro 3079 (Du--330707).

VERBENA CALIFORNICA Moldenke

Additional bibliography: Moldenke, Phytologia 8: 416--417. 1962.

Additional citations: CALIFORNIA: Tuolumne Co.: R. F. Hoover 3613 (N), 4130 (Du--501703).

VERBENA CALLIANTHA Briq.

Additional bibliography: Moldenke, Phytologia 13: 186. 1966.

Woolston describes this plant as a procumbent herb, 30--80 cm. long, with the corollas "deep rose-pink, the tube mauve-pink", growing on low campos.

Additional citations: PARAGUAY: Woolston 623 (S).

VERBENA CAMERONENSIS L. I. Davis

Additional bibliography: Anon., U. S. Dept. Agr. Bot. Subj. Index 15: 14360. 1958; Moldenke, Phytologia 14: 279. 1967.

The United States Department of Agriculture library, in the reference cited above (1958), dates the original publication of this binomial as August 15, 1941.

VERBENA CANADENSIS (L.) Britton

Additional synonymy: Verbena ambletia Lapham ex Moldenke, Résumé Suppl. 15: 24, in syn. 1967.

Additional & emended bibliography: Retz., Svenska Vet. Akad. Stockh. Nya Handl. 34: 143—146, pl. 5. 1773; Benth., Bot. Voy. Sulphur 153. 1846; Schnitzl., Icon. Fam. Nat. Reg. Veg. 137, fig. 3. 1856; A. Gray, Syn. Fl. N. Am., ed. 1, 2 (1): 337 (1876) and ed. 2, 2 (1): 337. 1886; L. H. Bailey, Man. Cult. Pl., ed. 1, pr. 1, 628, 630, & 848 (1924), pr. 2, 628, 630, & 848. 1925; T. H. Everett, Gard. Chron. Amer. 35: 179. 1931; I. N. Anderson, Nat. Hort. Mag. 12: 72—74. 1933; L. H. Bailey, Man. Cult. Pl., ed. 1, pr. 3, 628, 630, & 848. 1938; V. Quinn, Stories & Legends Gard. Fls. 219. 1939; L. H. Bailey, Man. Cult. Pl., ed. 1, pr. 4, 628, 630, & 848 (1944) and ed. 2, 840 & 1113. 1949; Hylander, MacM. Wild Flow. Book 337. 1954; R. M. Carleton, Ind. Common Names Herb. Pl. 100. 1959; Mohlenbrock & Voigt, Trans. Ill. Acad. Sci. 58 (4): 295. 1965; J. E. Moore, Castanea 30: 26. 1965; Moldenke, Phytologia 14: 279. 1967; Moldenke, Résumé Suppl. 15: 2 & 24. 1967; Zukowski, Fl. Polska 11: 65. 1967.

Additional illustrations: Schnitzl., Icon. Fam. Nat. Reg. Veg. 137, fig. 3 [in color]. 1856; T. H. Everett, Gard. Chron. Amer. 35: 179. 1931; I. N. Anderson, Nat. Hort. Mag. 12: 74. 1933.

Cory speaks of this plant as frequent in higher places among open woods in Jasper County, Texas, with the stems branched at the base, or with some branches elongate and prostrate, rooting at the nodes, while other branches are ascending, up to 4.5 dm. long. The common name "clump verbena" is applied to this species by Bailey (1924). Collectors have found the plant growing in rocky wooded cedar glades, in grazed open dry limestone glades on the top of high hills, and in "grass-forb prairie community". Iltis found it on dry steep partly wooded cedar glades on shallow limestone with Amsonia ciliata var. filifolia, Eriogonum longifolium, Lithospermum canescens, Aquilegia canadensis, Baptisia minor, Astragalus distortus, Taenidia integerrima, Sabina virginiana, Galium pilosum, G. virgatum, and Valerianella sp.

Quinn (1939) reports that Verbena canadensis is called "pleasant dream drink" by the Pawnees, but the Omahas call it "stomach-ache medicine". Zukowski records the species as both cultivated and escaped in Poland, citing Schalow 1931.

The Demaree s.n. [April 22, 1928] collection, cited below, is remarkable for its very white-hirsute stem. Mohlenbrock & Voigt (1965) cite a Voigt s.n. from Illinois.

It should be pointed out here that the very polymorphic V. canadensis of the United States is replaced in Mexico by V. elegans H.B.K. and its var. asperata Perry. The latter, because of its longer spikes, is sometimes difficult to distinguish from V. canadensis. However, in V. canadensis the plants are normally only somewhat and irregularly hirsute, the spike elongate conspicuously in age, the bractlets are slightly shorter than or equal to the calyx, the calyx is 10--13 mm. long, with weak and irregular pubes-

cence, and the calyx-teeth are 2--3 mm. long. In V. elegans var. asperata, on the other hand, the plants are always densely hispid-hirsute, the spikes remain compact at maturity, the bractlets are only 1/2 to 2/3 as long as the calyx, the calyx is only 8--10 mm. long, with uniform and stiff pubescence, and the calyx-teeth are rarely over 2 mm. long.

The Edw. Palmer 1051, distributed as V. canadensis, is actually V. delticola Small, while Nickerson s.n. [April 10, 1950] is V. tenuisecta Briq.

Additional citations: GEORGIA: Richmond Co.: T. J. Wray s.n. (Ws). ALABAMA: Tuscaloosa Co.: R. V. Moran 1353 (Du--309599). KANSAS: Douglas Co.: A. R. Moldenke 1429 (Ac). ARKANSAS: Benton Co.: Demaree s.n. [April 22, 1928] (Ws). Faulkner Co.: Demaree 5962 (Ws). Fulton Co.: Iltis & al. 21729 (Ws). Nevada Co.: Moore & Iltis 53206 (Ws). Washington Co.: Isely 2565 (Du--340098). White Co.: Iltis & al. 21668 (Ws), 21692 (Ws); H. S. Reynolds s. n. [Judsonia, May 22, '77] (Ms--30776). LOUISIANA: Parish undetermined: Lapham s.n. (Ws); Short s.n. [Louisiana] (Ms--30775). TEXAS: Brazos Co.: R. G. Reeves 20 (Ms--44661). Jasper Co.: Cory 52728 (Du--362509), 52864 (Du--362508). CULTIVATED: Germany: Herb. F. J. Young s.n. (Ws).

VERBENA CANESCENS H.B.K., Nov. Gen. & Sp. Pl., ed. folio, 2: 221--222, pl. 136. 1817 [not V. canescens Chapm., 1860].

Additional & emended bibliography: H.B.K., Nov. Gen. & Sp. Pl., ed. folio, 2: 221--222, pl. 136 (1817), ed. quart., pl. 136 (1817), and ed. quart., 2: 274. 1818; A. Gray, Syn. Fl. N. Am., ed. 1, 2 (1): 336--337 (1878) and ed. 2, 2 (1): 336--337. 1886; Barnhart, Bull. Torrey Bot. Club 29: 590. 1902; Schubert, Assoc. Trop. Biol. Bull. 4: 88. 1965; J. A. Clark, Gray Herb. Card Ind. issue 245. 1965; Holmgren & Reveal, U. S. Forest Serv. Res. Paper INT.32: [Checklist Vasc. Pl. Intermont. Reg.] 91. 1966; Moldenke, Phytologia 14: 279--280 & 294. 1967.

Additional & emended illustrations: H.B.K., Nov. Gen. & Sp. Pl., ed. folio, 2: pl. 136 [in color] (1817) and ed. quart., 2: pl. 136. 1817.

The Andrew Moldenkes refer to this plant as "prostrate in open alpine field" and as "abundant on road shoulders". Their no. 2340 is said to have had "blue" corollas.

It should be noted here that the H.B.K. reference dates given above have been authenticated by Barnhart (1902).

The Stanford, Lauber, & Taylor 2174a & 2252, previously cited as V. canescens, prove to be var. roemeriana (Scheele) Perry instead, Ravenel s.n. [Rome, 1868] is V. bracteata Lag. & Rodr., and Pringle s.n. [June 14, 1881] is V. plicata Greene.

Additional citations: MEXICO: Coahuila: Edw. Palmer 1047 (Ms--30832). Hidalgo: Moldenke & Moldenke 2333 (Rf). Nuevo León: Mol-

denke & Moldenke 2340 (Ac). Oaxaca: Pringle 4784 (Ms--30778).
 Puebla: Moldenke & Moldenke 2318 (Ac).

VERBENA CANESCENS f. *ALBIFLORA* Moldenke

Additional bibliography: Schubert, Assoc. Trop. Biol. Bull. 4: 88. 1965; J. A. Clark, Grat Herb. Card Ind. issue 245. 1965; Moldenke, Phytologia 13: 246. 1966.

VERBENA CANESCENS var. *ROEMERIANA* (Scheele) Perry

Additional bibliography: Moldenke, Phytologia 14: 280 & 294. 1967.

The M. E. Jones 28296, cited below, was erroneously cited by me as V. neomexicana var. hirtella in a previous installment of these notes, and Stanford, Lauber, & Taylor 2174a & 2252 were erroneously cited as typical V. canescens H.B.K.

Stanford, Lauber, & Taylor describe the plant as an herb to 12 inches tall, inhabiting extremely dry areas in old fields. The corollas are described as "blue" on their no. 2174a and as "lavender-blue" on no. 2252. The Andrew Moldenkes refer to the plant as an "abundant roadside weed" in Chihuahua and describe the corollas on their no. 2128 as "blue".

Additional citations: TEXAS: Kinney Co.: C. R. Orcutt 5053 (Du--155012). Val Verde Co.: M. E. Jones 28296 (Du--239763). MEXICO: Chihuahua: Moldenke & Moldenke 2097a (Rf). Durango: Moldenke & Moldenke 2128 (Rf). Nuevo León: Edw. Palmer 1044 (Ms--30779). Tamaulipas: Stanford, Lauber, & Taylor 2174a (Du--366136, N), 2252 (Du--366172, N).

VERBENA CAROLINA L.

Emended synonymy: *Verbena biserrata* H.B.K., Nov. Gen. & Sp. Pl., ed. folio, 2: 223. 1817. *Verbena veronicaefolia* H.B.K., Nov. Gen. & Sp. Pl., ed. folio, 2: 223. 1817 [not V. veronicaefolia J. Sm., 1845].

Additional & emended bibliography: H.B.K., Nov. Gen. & Sp. Pl., ed. folio, 2: 222--223 (1817) and ed. quart., 2: 274--275. 1818; N. J. Anderss., Vet. Akad. Handl. Stockh. 1853: 199--200. 1854; N. J. Anderss., Galap. Veg. 81. 1859; B. L. Robinson, Proc. Am. Acad. 38: 196. 1902; Barnhart, Bull. Torrey Bot. Club 29: 590. 1902; Holmgren & Reveal, U. S. Forest Serv. Res. Paper INT.32: [Checklist Vasc. Pl. Intermont. Reg.] 91. 1966; Moldenke, Phytologia 14: 280 & 297. 1967.

Recent collectors have found this plant growing along streams and on steep slopes with Quercus and Pinus, on dry grazed slopes with Agave, Opuntia, Acacia, and Solanum polyadenium, and at the edge of Pinus-Quercus woods and grazed fields and along rock-brush walls, with Solanum stenophyllidium, S. inscendens, and Rubus. Rosas R. calls it "abundant" in Veracruz. The Andrew Moldenkes refer to the plant as "a weed in mowed areas" in Oaxaca, an "abundant roadside weed" in Chiapas, "growing in alpine roadsides" in

Tlaxcala, "on road shoulders" in México, and "a very abundant weed in corn-growing areas" in the Federal District of Mexico. Their no. 2267 has galled inflorescences, while the corollas on their no. 2164 were "white with a violet central ring".

It should be noted that the original publication of this species by Linnaeus in his *Syst. Nat.*, ed. 10, 2: 852 is dated "1860" by Robinson, *Proc. Am. Acad.* 38: 196 (1902), and that of V. polystachya H.B.K. is dated "1817" by the same author. There is considerable confusion concerning the dates of publication of the N. J. Andersson papers. According to Robinson the *Vet. Akad. Handl. Stockh.* 1853: 199—200 paper was issued in 1854 and the paper with the same title, "Om Galap. Veg.", was issued later by Andersson with separate pagination and dated "1857", but on page 80 cites a publication issued in 1859, so its date of issue is probably no earlier than 1859. The H.B.K. reference dates given above have been authenticated by Barnhart (1902).

Hooker (1847), Andersson (1854, 1859), and Robinson (1902) record V. carolina from James Island of the Galapagos Islands on the basis of a C. Darwin collection. I have not as yet seen this collection, since all efforts to borrow it from the herbaria where it may be deposited have failed, but thus far all specimens seen by me from the Galapagos and identified as V. carolina have proved to be V. sedula Moldenke.

The corollas are described as "blue" on Breedlove 10856, 11159, & 12324, Hinton 12974, and Rosas R. 94. The H. S. Gentry 6212, distributed as V. carolina, is actually f. albiflora Moldenke, Wiggins & Wiggins 18075 is V. menthaefolia Benth., Edw. Palmer 1040 and Pringle s.n. [July 18, 1884] are V. scabra Vahl, and Curtiss 1959 and Lewton s.n. are Stylodon carneus (Medic.) Moldenke.

Additional citations: ARIZONA: Santa Cruz Co.: Mason, Drouet, MacEwan, & Price 1808 (Du—500472). MEXICO: Chiapas: Breedlove 10856 (Mi), 11159 (Mi), 12324 (Mi); Moldenke & Moldenke 2267 (Rf). Durango: A. R. Moldenke 1563 (Ac). Federal District: G. L. Fisher s.n. [San Angel, July 18, 1924] (Ws); Moldenke & Moldenke 2164 (Ac, Rf). Guanajuato: A. R. Moldenke 1813 (Rf). Hidalgo: R. C. West D.3 (Ac), J.13 (Ac). México: Moldenke & Moldenke 2169 (Ac). Michoacán: Hinton 12974 (Du—345877); A. R. Moldenke 1746 (Ac), 1747 (Ac), 1748 (Rf), 1766 (Rf); Ugent & Flores C. 2168 (Ws). Nayarit: A. R. Moldenke 1642 (Ac). Oaxaca: Moldenke & Moldenke 2302 (Rf), 2306 (Ac); Pringle 4892 (Ms—30808). Puebla: Ugent & Flores C. 2524 (Ws). Tlaxcala: Moldenke & Moldenke 2191b (Rf). Veracruz: Rosas R. 94 (Rf), 253 (Ac). GUATEMALA: Chimaltenango: Molina R. & Molina 12464 (N). HONDURAS: Copán: Molina R. 12892 (N).

VERBENA CAROLINA f. ALBIFLORA Moldenke

Additional bibliography: Moldenke, *Phytologia* 13: 188. 1966.

Additional citations: MEXICO: Hidalgo: R. C. West B.25 (Z).

SYSTEMATIC NOTES ON MICRONESIAN PLANTS. 3

By F. R. Fosberg

Included in this paper are notes on Micronesian Sagittaria, Egeria, Lepturus, Crinum, Spathoglottis, Lepidium, Mimosa, Cassia, Clitoria, Cordia, and corrections to my Check List of the Seed Plants of Guam. The first two papers in this series were published in *Phytologia* 5:289-292, 1955; 13:233-241, 1966.

SAGITTARIA SUBULATA var. KURZIANA (Glück) Bogin, Mem. NYGB 9: 205, 1955.

S. kurziana Glück, Bull. Torrey Club 54: 257, 1927 (originally described from Florida, and native in slow-moving streams there).

Guam: Agana Springs, B.C. Stone 4979 (US). This was reported from Guam by B.C. Stone (*Micronesica* 1:132, 1964) simply as S. subulata (L.) Buch. but seems better to match the variety kurziana, as the leaves (phyllodes) are more than 7 mm wide and reach as much as 10 mm. The plants are not more than 40 cm long, which is about a minimum for this variety.

EGERIA DENSE Planch., Ann. Sci. Nat. Bot. III, 11:80, 1849.

Elodea densa (Planch.) Casp., Monatsb. Kgl. Preuss. Akad. Wiss. 1857: 48, 1857.

Guam: in quiet eddy-pools of the Talofofa River near the mouth, July 22, 1962, Stone 4305 (US).

This is a species native to the Paraná Drainage of Southern South America, widely used as an aquarium plant. It was doubtless brought to Guam by aquarium enthusiasts or their suppliers, and planted in the river. (See St. John, *Darwiniana* 12:293-307, 1961).

LEPTURUS GASPARRICENSIS X REPENS var. SEPTENTRIONALIS

Lepturus is the most generally distributed indigenous grass in the Pacific Islands, found in lowland situations, especially on coral sand and limestone throughout the tropical Pacific islands except the Main Hawaiian group and the islands near the American coast. It is notoriously variable, both from population to population and within a population. There is even troublesome variation between

corresponding parts of different branches of the same plant.

In my admittedly conservative view there are only two species of Lepturus in the Pacific islands, one of them L. repens (Forst. f.) R. Br., widespread and with a considerable number of ill-distinguished varieties (see Fosberg, Occ. Pap. Bish. Mus. 21: 285-294, 1955). The other, L. gasparricensis Fosb. confined to Wake and Pokak atolls, at the northern end of the Marshall Archipelago. In these two atolls both species grow together, L. repens being by far the most abundant. It is represented here by its var. septentrionalis, a slender, narrow-leaved form with spikes less than 1.2 mm thick. L. gasparricensis is very robust, with ascending, rather than repent basal branches, spikes 2 mm or more thick, glumes obtuse rather than subulate.

Not too much is known about the L. repens population on Pokak, but it seems probable that var. septentrionalis is the only variety there. It shows great variation in habit and length of fertile culms.

Earlier observations indicated little or no intergradation between L. repens and L. gasparricensis, with the latter very local in its distribution. Observations in the 1960's indicate that it is spreading along roadsides and in other open disturbed places. It generally grows with L. repens, and the two maintain their identities remarkably well. However, several collections recently received or restudied seem to combine the characters of the two species in a manner that suggests a certain amount of hybridization and perhaps back-crossing. These are described here in the hope that further observations and perhaps a careful population analysis may be stimulated. Wake Island, at least, is readily accessible and convenient for such work.

Wake Is.: Toki Point, Peale I., McFarlane 26 (US, UH).

This has the habit of L. gasparricensis but is only about 22 cm tall, more slender, spikes 1.2 mm thick, glume 9 mm long with slender awn. It was growing with L. gasparricensis, and L. repens var. septentrionalis is never very far away on Wake Island.

Wake Island: Peale Islet, Fosberg 43510 (US).

This collection has already been distributed to a number of herbaria, as L. repens var. subulatus, but a reexamination of the U.S. sheet of it suggests that the population represented is probably of hybrid origin. The four pieces on this

sheet are not quite identical, the glumes varying from acute or slightly acuminate on one piece, to strongly acuminate on another, to subulate on the others. The habit is much coarser than that of var. septentrionalis but less coarse than that of L. gasparricensis, about that of var. subulatus. The thickness of the spikes varies from about 1.3 to 1.8 mm.

Wake Island: s.e. tip of Peale Islet, Lopez 3 (US).

This material was found mixed with Lopez 1, which is L. gasparricensis and was collected in the same location as Lopez 2, which is a very slender form of L. repens var. septentrionalis. It is, in habit, more slender than L. gasparricensis, has running stolons, spikes almost as slender as those of var. septentrionalis, and glumes only moderately subulate. If found elsewhere it would doubtless be placed in L. repens var. subulatus. However, occurring as one plant with the two other species that it is exactly intermediate between, it seems best regarded as a hybrid.

Marshall Is.: Pokak (Taongi) Atoll, Kamome Islet, Fosberg 34509 (US).

This plant, also growing in the same vicinity as L. repens var. septentrionalis and L. gasparricensis is intermediate in stature between the two, but has spikes much more like those of var. septentrionalis. It resembles L. repens var. subulatus but has the basal branches strongly ascending, as in L. gasparricensis, rather than creeping as in L. repens.

CRINUM BAKERI Schum., Bot. Jahrb. 9:194, 1888.

Little or nothing has been known of this species, subsequent to its original description, based on a specimen from Mille, Marshall Islands, collected by Finsch. It was characterized by having the perianth lobes longer than the tube, a character which I at first assumed might have resulted from an accident in preparation of the specimen. That this was not true was shown by the discovery in 1956 of a row of plants with exactly this characteristic, planted in the village on Utirik Islet, Utirik Atoll, Marshall Islands, Fosberg 36713 (US, Fo). Seeds from these plants were planted in Honolulu, giving rise to plants which flowered and were collected in 1960, Fosberg 41421 (Fo). The flowers on these plants preserved the character originally noted in the description, the perianth lobes exceeding the tube. The anthers are 25-27 mm long. This species is of the relationship of C.

asiaticum L. The several species commonly recognized of this relationship, including C. asiaticum, C. bakeri, C. amabile, C. rumphii, and C. procerum, at least, seem too close together, and are badly in need of revision. Some of them are only known as cultivated plants, or possible escapes from cultivation, and may really be the results of either modern or prehistoric horticultural selection.

SPATHOGLOTTIS PLICATA Bl., Bijdr. 401, t. 76, 1825.

This species differs from the two indigenous Micronesian species most conspicuously in its broader leaves and its deep magenta rather than white or pink flowers. It seems to have been introduced into Guam in recent years and has become generally abundant in various parts of the island.

Marianas: Guam: west side of Northwest field, 160 m, Fosberg 43439 (US, BISH, Fo); sandspit near OSIR road, Apra Harbor, Stone 4458 (CG).

LEPIDIDIUM BIDENTATUM Mont. Nov. Act. Nat. Cur. 6:324, t.5, 1778.

L. piscidium Forst.f., Pl. Esc. 70, 1786.

This is a widespread and variable species growing on coral atolls and in lowland localities near the sea from as far west as New Caledonia (the type locality) eastward to Southeastern Polynesia, northward in the Line Islands and on Wake Island. Wake is the only known Micronesian station for it. Earlier records from Wake are reported under the name Lepidium o-waihiense C. & S., but the Wake Island specimens (Fosberg 43526 (US, BISH, Fo), 34930 (US, BISH)) have the silicles substantially longer than wide, while the Hawaiian plant described as L. o-waihiense has them almost or quite as wide as long.

MIMOSA INVISA Mart., Herb. Fl. Bras. 121, 1837.

This unpleasant, viciously spiny Brazilian creeper, resembling but larger than the common sensitive plant, Mimosa pudica L., has been in the Pacific area at least since 1918, when it was collected in Sumatra. It has been reported from Fiji more recently (Mune, T. L. and Parham, J. W., Declared Noxious Weeds of Fiji...28, 1956) as introduced from Malaya in 1936. In 1950 it was found established in Micronesia in Rota, Saipan and Palau, and collected as follows:

Marianas Is.: Saipan, base of Kagman Peninsula near Chacha, local in thickets and broken ground at 60 m elevation. Fosberg 31289. Rota, slopes west of As Malote, on the south side of the island in agricultural land, at 150 m, Fosberg 31916.

Caroline Is.: Palau, Koror, Ngliaklölubed, in weedy ground beside cassava patch, 50 m Fosberg 32503. Sterile plants seen on Yap in 1965 were probably this species, as were ones planted in experimental plots as a green manure in Saipan. It should be ruthlessly eradicated wherever found.

CASSIA SURATTENSIS Burm. f., Fl. Ind. 97, 1768.

C. glauca Lam. Encycl. Meth. 1:647, 1783.

This cultivated ornamental was recorded from Guam as C. glauca by Stone, Micronesica 1:133, 1964. The two names are generally regarded as synonymous. There are several earlier Micronesian collections:

Marianas Is.: Guam, Agana Heights, Whiting 304 (Fo); behind Tumon Bay, Conover 593 (US);

Caroline Is.: Kusaie, Tomasakku, Takamatsu 569 (BISH).

It is said to be called "sibukao" in Guam.

CLITORIA GUIANENSIS (Aubl.) Benth., Journ. Linn. Soc. 2:40, 1858.

This species, previously known in the Pacific area only from Malesia, may be reported from Micronesia on the basis of the following collection:

Palau Is.: Babeldaob: west coast, Nekken Experimental Station, 150 feet, Richardson 62 (US). The collector says it was found around Ichiro Dingilius' house, "a small-growing perennial legume with a blue flower, very low growing, apparently common, as Ichiro was familiar with it." Mr. Bob Richardson spent 5 weeks in Palau in the summer of 1967, studying the savanna vegetation, and making a collection of herb-rium material. Several of the specimens, including the above, are of considerable interest.

This is the broad leafed rather canescent form, often called C. laurifolia Poir. or C. cajanifolia (Presl) Benth., but not differing in any very constant fashion from C. guianensis. It is readily distinguished from the common C. ternatea by its non-climbing habit.

CORDIA SEBESTENA L., Sp. Pl. 1:190, 1753.

This species has become fairly common in cultivation in Guam. It strongly resembles C. subcordata Lam., of which it seems to be the Caribbean vicariant. It differs in the firmer, more ovate, more nearly cordate, rougher leaves, narrower, strongly striate calyx, and deeper scarlet flowers. It flowers more abundantly and more continuously.

Marianas: Guam: Manguuao, abandoned nursery site, Fosberg 35592 (US); Agana, Fosberg 46281 (US, BISH, Fo), Stone 3916 (CG).

A number of additions and name changes are required in my 1960 Check List of the Seed Plants of Guam. Some of these have been listed by B.C. Stone in his papers entitled Additions to the Flora of Guam, Micronesica 1:131-135, 1964; 2:47-50, 1965; 2:133-141, 1966. Several more are given below, with the page on which they are or should be listed in the 1960 Check List, and with references to where changes have appeared in literature possibly unfamiliar to those concerned with Micronesian plants.

ERAGROSTIS TENELLA (L.) Beauv. should replace Eragrostis amabilis (L.) W.&A. (Bor. N.L., Grasses of Burma, Ceylon, India and Pakistan 513-514, 1960), p. 4 of Check List.

PANICUM REPTANS L. should be added (Fosberg & Sachet, Micronesica 2:154, 1966), p. 5.

RHAPHIDOPHORA AUREA (Lind. & André) Birdsey should replace Scindapsus aureus (Lind. & Andr.) Engl. (Birdsey, Baileya 10:159, 1962), p. 10.

SANSEVIERIA GUINEENSIS (L.) Willd. should replace Sansevieria roxburghiana Schultes (Stearn, Hunt Bot. Cat. 2:LII, 1961), p. 11.

MACADAMIA INTEGRIFOLIA Maiden & Betcher should replace Macadamia ternifolia F. Muell. (Storey, Pac. Sci. 19:507-514, 1965), p. 17.

CANAVALIA CATHARTICA Thouars should replace Canavalia microcarpa DC. (Sauer, Brittonia, 6:158-162, 1964), p. 23.

EUPHORBIA REINWARDTIANA Steud. should replace Euphorbia serrulata Reinw. ex. Bl. (non E. serrulata Thuill. 1790) (Steudel. Nom. ed. 2, 614-615, 1840), p. 29.

ZIZYPHUS MAURITIANA Lam. should replace Zizyphus jujuba L.
p. 32.

MELOCHIA COMPACTA Hochr. should replace Melochia umbellata
(Houtt.) Stapf (Goldberg, Contr. U.S. Nat. Herb. 34:220-224,
236-238, 1967), p. 34

ABERIA CAFFRA How. & Sand. is a correction in spelling, p. 34.

IXORA TRIANTHA Volk. is a correction in spelling, p. 48.

BIKKIA MARIANNENSIS Brongn. was inadvertently omitted from
Check List, p. 47.

X PLUCHEA FOSBERGII Coop. & Gal. should be added (Cooperrider
and Galang, Amer. Jour. Bot. 52:1020-1026, 1965), p. 51.

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